

April 4, 2019

Conor Whetsel
Colorado Air Pollution Control Division
4300 Cherry Creek Drive South, APCD-SS-B1
Denver, CO 80246
Cdphe.commentsapcd@state.co.us

Re: Comments on Proposed Title V Permit, Sand Ridge Exploration and Production, LLC, Bighorn Pad, Permit No. 17OPJA401

Dear Mr. Whetsel:

WildEarth Guardians submits the following comments on the Air Pollution Control Division's ("APCD's") proposed Clean Air Act Title V Operating Permit for Sand Ridge Exploration and Production's Bighorn Pad in Jackson County, Colorado, Permit No. 17OJA401.

We object to the APCD's proposed Title V Permit. The Bighorn Pad is currently operating out of compliance with applicable requirements under the Clean Air Act. Unfortunately, the proposed Title V Permit does not bring the facility into compliance with the Clean Air Act or otherwise ensure that operation of the facility will be consistent with applicable requirements. Accordingly, the APCD must either deny the proposed Permit or rewrite the proposed Permit consistent with Title V requirements under the Clean Air Act.

#### **BACKGROUND**

Under Clean Air Act, the APCD must ensure that any Title V Operating Permit includes emissions limitations and standards that assure compliance with applicable requirements. *See* 40 C.F.R. § 70.6(a)(1); *see also* Air Quality Control Commission ("AQCC") Regulation No. 3, Part C, Section V.C.1. Applicable requirements include any "standard or other requirement" set forth in the Colorado State Implementation Plan ("SIP"). 40 C.F.R. § 70.2 (setting forth definition of "Applicable requirement"). Where a source is not in compliance with applicable requirements, the APCD must ensure that any Title V Operating Permit includes "[a] schedule of compliance." 40 C.F.R. § 70.6(c)(3); *see also* AQCC Regulation No. 3, Part C, Section V.C.16.c. Such a schedule must include a "schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance[.]" 40 C.F.R. § 70.5(c)(8)(C); *see also* AQCC Regulation No. 3, Part C, Section III.C.9.

In this case, the proposed Title V Permit not only fails to ensure that the Bighorn Pad operates in compliance with applicable requirements, but also fails to include a schedule of compliance to bring the Bighorn Pad into compliance with applicable requirements.

2590 Walnut Street Denver CO, 80205 720-644-8064 wildearthguardians.org

DENVER + MISSOULA + PORTLAND + SANTA FE + SEATTLE + TUCSON

Accordingly, the proposed Permit fails to comply with the Clean Air Act and applicable requirements under 40 C.F.R. § 70 and under Colorado's approved Title V permitting program.

#### PSD VIOLATIONS AT BIGHORN PAD

At issue is the fact that Sand Ridge illegally constructed and began operating a major stationary source of air pollution without complying with major source permitting requirements the Clean Air Act's Prevention of Significant Deterioration ("PSD") program and the Colorado SIP at AQCC Regulation No. 3, Part D.

Under the Colorado SIP, a new major stationary source of air pollution "shall not begin" actual construction unless a permit has been issued containing "all applicable state and federal requirements." AQCC Regulation No. 3, Part D, Section I.A.1. Within attainment or unclassifiable areas, a "major stationary source" is defined as "any stationary source that emits, or has the potential to emit" 250 tons per year or more of any regulated new source review pollutant. AQCC Regulation No. 3, Part D, Section II.A.24.a.(ii). "Potential to emit" is defined under the SIP as, "The maximum capacity of a stationary source to emit a pollutant under its physical and operational design." AQCC Common Provisions Regulation, Section I.G. To the extent that emission controls or other physical or operational limitations are factored into the calculation of potential to emit, such limitations can only be considered against a source's maximum capacity to emit if they are "state enforceable and federally enforceable." *Id*. The term "federally enforceable" means all limitations and conditions that are "enforceable by the U.S. [Environmental Protection Agency] Administrator." *Id*.

Under the Clean Air Act's PSD program and the Colorado SIP, a permit for a major source in an attainment or unclassifiable area can only be issued if it meets a number of requirements. Among them, a permit can only be issued if it meets "best available control technology" requirements, if a source impact analysis demonstrates that emissions "will not cause or contribute to" violations of PSD increments or national ambient air quality standards, if it is based on an analysis of impacts to visibility and other air quality-related values, and if it is based on appropriate pre-construction monitoring. *See generally* AQCC Regulation No. 3, Part D, Section VI.

Here, the Bighorn Pad was a major stationary source when it was constructed and first put into operation. Unfortunately, Sand Ridge never obtained a PSD permit and has since failed to operate the Bighorn Pad in compliance with any PSD requirements.

That the Bighorn Pad was a major stationary source when it was constructed and first put into operation is confirmed by Sand Ridge's own certified reports to state regulators.

According to records with the Colorado Oil and Gas Conservation Commission, the two Hebron wells that make up the Bighorn Pad were spudded in April 2016, meaning that construction commenced at or around that time. *See* Exhibit 1, Notices of Spudding for Hebron 3-18H and Hebron 4-7H Wells. The wells were subsequently subject to hydraulic fracturing in May 2016. *See* Exhibit 2, Notices of Hydraulic Fracturing Treatment for Hebron 3-18H and Hebron 4-7H Wells. According to Sand Ridge, the wells were put into production in June 2016.

See Exhibit 3, Annual Pollutant Emission Notice ("APEN") for Crude Oil Storage Tanks at Bighorn Pad.

It was not until September 21, 2016 that Sand Ridge first applied for a construction permit for the Bighorn Pad pursuant to the Colorado SIP and submitted APENs for its emission points to the APCD. The company's application and APENs disclosed that the Bighorn Pad's potential to emit for volatile organic compound ("VOC") emissions amounted to 2,654.38 tons per year. *See* Exhibit 4, Bighorn Pad Application Submittal (Sept. 21, 2016). In spite of this, Sand Ridge's September 2016 permit application was not for a major source permit. Instead, Sand Ridge only sought a minor source construction permit pursuant to AQCC Regulation No. 3, Part B.

Accordingly, Sand Ridge failed to obtain the proper major source PSD permit for the Bighorn Pad prior to construction and operation. The proposed Title V Permit must therefore be written to bring the facility into compliance with PSD or otherwise be denied.

Although APCD and Sand Ridge may claim that the Bighorn Pad operated with emission controls after being constructed and put into operation, any emission controls utilized at the facility were not subject to any federally enforceable limits. It is telling that in applying for a preconstruction permit in September 2016, six months after beginning construction of the Bighorn Pad, Sand Ridge sought a "synthetic minor" preconstruction permit pursuant to AQCC Regulation No. 3, Part B. A synthetic minor permit can only be issued to a source that would be a major but for the establishment of federally enforceable limits. The fact that Sand Ridge sought a synthetic minor permit in September 2016 underscores that the Bighorn Pad was a major source when construction began and when the facility was put into operation.

While Sand Ridge ultimately obtained a synthetic minor preconstruction permit, the company obtained the permit in August 2017. *See* Exhibit 5, Construction Permit 16JA1055 (Aug. 28, 2017). This means that Sand Ridge constructed and operated a major source for nearly a year and a half before ever obtaining a permit pursuant to the Colorado SIP.

Furthermore, the issuance of this synthetic minor permit did not serve to absolve Sand Ridge of its duty to comply with major source permitting requirements. Sand Ridge was required to obtain and operate in compliance with a major source permit prior to construction of the Bighorn Pad. The Colorado SIP does not allow major sources to construct and begin operations, and then apply for and obtain a synthetic minor permit after the fact. If a polluter desires to have its stationary source of air pollution permitted as a synthetic minor source, the Colorado SIP requires that the polluter apply for and obtain a synthetic minor permit prior to construction.

<sup>&</sup>lt;sup>1</sup> The Colorado SIP allows oil and gas production facilities that are minor sources to submit construction permit applications within 90 days after the date of first production. *See* AQCC Regulation No. 3, Part B, Section II.D.7. However, this provision does not allow major sources to construct and begin operating prior to obtaining a major source permit pursuant to AQCC Regulation No. 3, Part D. In fact, federal PSD rules explicitly state that SIPs must ensure that "no new major stationary source [] shall begin actual construction without a permit" that ensures a source operates in compliance with applicable PSD requirements. 40 C.F.R. § 51.166(a)(7)(iii). This requirement is echoed in the Colorado SIP at AQCC Regulation No. 3, Part D.

Finally, the permit issued in August 2017 simply did not require the use of best available control technology or otherwise ensure protection of air quality consistent with PSD requirements under the Colorado SIP at AQCC Regulation No. 3, Part D. To this day, the Bighorn Pad is not operating in compliance with a PSD permit and not operating in a manner that equates to compliance with PSD requirements under the Colorado SIP.

#### THE TITLE V PERMIT MUST BE DENIED OR REWRITTEN

Given Sand Ridge's ongoing noncompliance with PSD permitting requirements under the Colorado SIP, the APCD must deny the proposed Title V Permit as drafted as it would fail to assure the Bighorn Pad operates in compliance with applicable requirements.

If the APCD believes a Title V Permit should be approved, it must instruct Sand Ridge to submit a new permit application that contains a compliance schedule and it must rewrite the permit to both incorporate this compliance schedule and assure the Bighorn Pad operates in compliance with PSD permitting requirements.

Thank you for the opportunity to comment.

Sincerely,

Jeremy Nichols

Climate and Energy Program Director

WildEarth Guardians

2590 Walnut St.

Denver, CO 80205

(303) 437-7663

inichols@wildearthguardians.org

cc: Monica Morales, Air Program Director, EPA Region 8

# Exhibit 1

FORM 42 Rev 03/15

# State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303) 894-2100 Fax: (303) 894-2109



#### OGCC RECEPTION

Receive Date: 04/01/2016

Document Number: 401019886

#### **FIELD OPERATIONS NOTICE**

The Form 42 shall be submitted as required by Rule, Notice to Operators, Policy, or Condition of Approval.

A Form 42 Update shall be submitted to revise the scheduled date or time on a previous Form 42 - Advance Notice of Field Operations.

A Form 42 Update must be for the same well, location, or facility and for the same Field Operation as a previous Form 42.

NOTE: Operator's Contact for Advance Notices of Field Operations should be available 24 hours a day, 7 days a week and should have the most current scheduling information for the operation. Operator's Contact for other notices should be able to respond to questions regarding the reported information.

Update of a previous Form 42 Notice NO	
Entity Information	<u>on</u>
OGCC Operator Number: 10598	Contact Person: Spence Laird
Company Name: SANDRIDGE EXPLORATION & PRODUCTION LLC	Phone: (405) 4296518
Address: 123 ROBERT S KERR AVE	Fax: ( )
City: OKLAHOMA CITY State: OK Zip: 73102	Email: slaird@sandridgeenergy.com
API #: 05 - 057 - 06545 - 00 Facility ID:	Location ID:
Facility Name: Hebron 0780 4-7H	Submit By Other Operator
Sec:         17         Twp:         7N         Range:         80W         QtrQtr:         NWNW	Lat: 40.584658 Long: -106.405128
NOTICE OF SPUD – 48-hour notice required Surface Hole Spud ONLY	
Spud Date: 04/02/2016 Time: 14:00 (HH:MM)	
Rig Name: Xtreme 20	
I hereby certify all statements made in this form are, to the best of my know	vledge, true, correct and complete.
Print Name: Spence Laird Email: slaird@	sandridgeenergy.com
Signature: Title: Regulat	ory Supervisor Date: 04/01/2016

FORM 42 Rev 03/15

# State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303) 894-2100 Fax: (303) 894-2109



#### OGCC RECEPTION

Receive Date: 04/28/2016

Document Number: 401037936

#### **FIELD OPERATIONS NOTICE**

The Form 42 shall be submitted as required by Rule, Notice to Operators, Policy, or Condition of Approval.

A Form 42 Update shall be submitted to revise the scheduled date or time on a previous Form 42 - Advance Notice of Field Operations.

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Update of a previous Form 42 Notice NO	
Entity Information	<u>ation</u>
OGCC Operator Number: 10598	Contact Person: Laci Bevans
Company Name: SANDRIDGE EXPLORATION & PRODUCTION LLC	Phone: (405) 429-5610
Address: 123 ROBERT S KERR AVE	Fax: ( )
City: OKLAHOMA CITY State: OK Zip: 73102	Email: lbevans@sandridgeenergy.com
API #: 05 - 057 - 06547 - 00 Facility ID:	Location ID:
Facility Name: Hebron 0780 3-18H	Submit By Other Operator
Sec: 17 Twp: 7N Range: 80W QtrQtr: NWN	W Lat: 40.584247 Long: -106.405131
NOTICE OF SPUD – 48-hour notice required Surface Hole Spud O	NLY
Spud Date: 04/29/2016 Time: 18:00 (HH:MM)	
Rig Name: Xtreme#20	
I hereby certify all statements made in this form are, to the best of my k	nowledge, true, correct and complete.
Print Name: Laci Bevans Email: Ibev	ans@sandridgeenergy.com
Signature: Title: Reg	ulatory Analyst Date: 04/28/2016

# Exhibit 2

FORM 42 Rev 03/15

# State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303) 894-2100 Fax: (303) 894-2109



OGCC RECEPTION

Receive Date: 05/12/2016

Document Number: 401045765

#### FIELD OPERATIONS NOTICE

The Form 42 shall be submitted as required by Rule, Notice to Operators, Policy, or Condition of Approval.

A Form 42 Update shall be submitted to revise the scheduled date or time on a previous Form 42 - Advance Notice of Field Operations.

A Form 42 Update must be for the same well, location, or facility and for the same Field Operation as a previous Form 42.

NOTE: Operator's Contact for Advance Notices of Field Operations should be available 24 hours a day, 7 days a week and should have the most current scheduling information for the operation. Operator's Contact for other notices should be able to respond to questions regarding the reported information.

Update of a previous Form 42 Notice NO					
	Entity Inf	ormation			
OGCC Operator Number: 10598			Contact Person:	Laci E	Bevans
Company Name: SANDRIDGE EXPLORATION & PRODUC	TION LLC		Phone: (405) 429-5610		
Address: 123 ROBERT S KERR AVE			Fax: ( )		
City: OKLAHOMA CITY State: OK Zip:	73102	<u>,                                      </u>	Email: lbevans@sandr	idgeenerg	y.com
API #: 05 - 057 - 06545 - 00 Facility ID:			Location ID:		
Facility Name: Hebron 0780 4-7H			Submit By Other	Operator	
Sec:         17         Twp:         7N         Range:         80W	QtrQtr:	NWNW	Lat: 40.584658	Long:	106.405128
NOTICE OF HYDRAULIC FRACTURING TREATMENT -	- 48-hour r	otice require	<u>d</u>		
Date of Treatment: 05/12/2016 Time:	09:00	(HH:MM)	Anticipated Date of	Flowback	05/20/2016
FOR GAS WELLS ONLY:					
This well is a Gas Well, anticipated to have a Gas-to	o-Oil Ratio	(GOR) equa	I to or greater than 15,000	) scf/bbl.	
This Form 42 is submitted to satisfy notification requ	uirements	under NSPS	0000, 40 C.F.R. Part 60	0, &60.542	20(a)(2)(i).
I hereby certify all statements made in this form are, to t	he best of	my knowledo	ge, true, correct and comp	lete.	
Print Name: Laci Bevans	Email:	lbevans@sa	andridgeenergy.com		
Signature:	Title:	Regulatory	Analyst	Date:	05/12/2016

Date Run: 5/12/2016 Doc [#401045765] Well Name: Hebron 0780 4-7H

FORM 42 Rev 03/15

# State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303) 894-2100 Fax: (303) 894-2109



OGCC RECEPTION

Receive Date: 05/13/2016

Document Number: <u>401046808</u>

#### **FIELD OPERATIONS NOTICE**

The Form 42 shall be submitted as required by Rule, Notice to Operators, Policy, or Condition of Approval.

A Form 42 Update shall be submitted to revise the scheduled date or time on a previous Form 42 - Advance Notice of Field Operations.

A Form 42 Update must be for the same well, location, or facility and for the same Field Operation as a previous Form 42.

NOTE: Operator's Contact for Advance Notices of Field Operations should be available 24 hours a day, 7 days a week and should have the most current scheduling information for the operation. Operator's Contact for other notices should be able to respond to questions regarding the reported information.

Update of a previous Form 42 Notice NO						
	Entity Inf	ormation				
OGCC Operator Number: 10598			Contact P	erson:	Spend	e Laird
Company Name: SANDRIDGE EXPLORATION & PRODUC	CTION LLC		Phone: (4	105) 4296518		
Address: 123 ROBERT S KERR AVE			Fax: (	)		
City: OKLAHOMA CITY State: OK Zip:	73102	2	Email: s	laird@sandrid	geenergy.c	com
API #: 05 - 057 - 06547 - 00 Facility ID:			Location	on ID:		_
Facility Name: Hebron 0780 3-18H			Su	bmit By Other	Operator	
Sec:         17         Twp:         7N         Range:         80W	QtrQtr:	NWNW	Lat:	40.584247	Long:	106.405131
NOTICE OF HYDRAULIC FRACTURING TREATMENT	– 48-hour r	notice require	<u>d</u>			
Date of Treatment: 05/16/2016 Time:	10:00	(HH:MM)	Antici	pated Date of	Flowback:	06/03/2016
FOR GAS WELLS ONLY:						
This well is a Gas Well, anticipated to have a Gas-	to-Oil Ratio	(GOR) equa	ıl to or grea	ter than 15,00	0 scf/bbl.	
This Form 42 is submitted to satisfy notification rec	uirements	under NSPS	0000, 40	C.F.R. Part 6	0, &60.542	20(a)(2)(i).
		***************************************				
I hereby certify all statements made in this form are, to	the best of	my knowled	ge, true, coi	rect and comp	olete.	
Print Name: Spence Laird	Email:	slaird@sand	dridgeenerg	y.com		
Signature:	Title:	Regulatory	Supervisor		Date: _	05/13/2016

Date Run: 5/13/2016 Doc [#401046808] Well Name: Hebron 0780 3-18H

# Exhibit 3

# AIR POLLUTANT EMISSION NOTICE (APEN) & Application for Construction Permit – Crude Oil Storage Tank(s)! umber: \( \lambda \la

	Number: Equipment		<u>ソハリクフ</u> de Oil Tanks		ntess APCD bas a a Facility Fonima							ission Source AIRS ID: US 17 / US 1 /
			Information	(472.70	v v saviety singistyre	70177 777 777 777			,			d Action (Check applicable request boxes)
***************************************			: Exploration and Prod	action, LLC	NAICS, or	1311		<u>360.0</u>	Reg	uest for !	NEW	V INDIVIDUAL permit rage under GENERAL PERMIT GP88
Sou	ree Name:	Bìghorn P	ad		<ul><li>SIC Code:</li></ul>		•					ICATION to existing INDIVIDUAL permit (check boxes below)
Source	Location:	NWNW S	e 17 T7N R80W		County:	Jackson						cess or equipment
	-		**************************************	***************************************	Elevation:	8,152	Feet			Change	e pen	mit limit Transfer of ownership Other
Mailing	; Address:	123 Rober	t S. Kerr Ave		 ZIP Code:	73182			APE	•	•	for Permit Exempt/Grandfathered source
		Oklaboma	City, OK	***************************************	****				APE	N Subm	ittal	for update only (Please note blank APEN's will not be accepted)
Person To	o Contact:	Dale Birds	v ({})	Phone	— Number: 405	i-429-5562		å ddi	. Info.			
E-mai	l Address:	dbirdwell(	gsandridgeenergy.com	Fax	Nurober:		***************************************	& No		13 pr	oduc	tion tanks, 2 emergency use
Section	03 – Gene	ral Inform	ation							***************************************		
For <u>exist</u> i	gg sources.	operation be	gan on:	1	1			Fo	r <u>new</u>	or recons	struci	ted sources, the projected startup date is: 6 / 23 / 2016
This Store	age Tank is	$\boxtimes$	Exploration & Produc (E&P) Site	tion	: 1	ream or De		:	N	ormal He	ours c	of Source Operation: 24 bours/ 7 days/ 52 weeks/ day 7 week 52 year
			- (15821) Sile 1 any NAAQS nonattains	ment area <sup>o</sup>	(Non-	E&P) Site	⊠ No		Α	m Flash l	Emis	day week year sions anticipated at these tanks System Yes No
➤ A	re you reque	esting≥6 ter	n/yr VOC amissions, or a	se uncentrolled	actual emission		rc?					☐ Yes 🗵 No
			subject to Colorado Oil a				CC) 805 se	ries rule	87 II s	io, submit	t For	m APCD-105. ☐ Yes ☑ No
General d	escription o	fequipment	purpose: Storage of	crude oil from	production w	ell						
Crude Oi			Information crmit Limit 229,826	bbl/year								Colorado Department of Public Health and Environment Air Pollution Control Division (APCD) This notice is valid for five
throughpe			Actual: 184,021		ctual While Co			*************	1	bbl/year		(5) years. Submit a revised APEN prior to expiration of five-year
100 A 60		•	of Sales Oil: 35	degrees	e		iales Oil					term, or when a significant change is made (increase production, new equipment, change in fuel type, etc).
Tank Des	ign:	Fixed Roof	internal l	loating Roof:	Ш	External	Floating R	eef:				Mail this form along with a check for \$152.90 per APEN for non-
Storage Tank ID	Storage	id Manifold Vessels in ge Tank	Total Volume of Storage Tank (bhl)	storage v	n Date of most essel in storag Month/Year)			Of Firs (Month		5		E&P, midstream and downstream sources or \$152.90 for up to five (5) APENs for E&P sources and \$250 for each general permit registration to:
	•	15	16,500		6/2016			6/21	)16			Colorado Department of Public Health & Environment
					***************************************				***************************************		38 8	APCD-SS-B1 4300 Cherry Creek Drive South
								******			33 <b>5</b>	Denver, CO 80246-1530
***************************************	000000000000000000000000000000000000000		ells Serviced by this Store	age Tank or Tani	Battery (F&P )	Sites Only)	******************************	******************				For guidance on how to complete this APPN forms
	API Numbe	,		Name of We	***************************************		N	ewly Re	ported	Well		Air Pollution Control Division: 13031.692-3150 Small Business Assistance Program (SBAP): 42031.692-3148 or
***************************************	5 - 057 - 065	······································		Hebron #0780 3	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~~~~~~	X			Small Business Assistance Program (SBAP): \(\sigma \)
0	<u> 5 – 057 - 065</u>	45	••••	Hebron #6780 4	i-7H						8 3	APEN forms: http://www.colorado.gov/cdpbe/oilgasAPENS
	* *							*************				Application status: http://www.colorado.gov/cdphs/permitsfatus
	· · ·		***************************************					*****************	<u> </u>			

FORM APCD-210

353703

Page 1 of 2

Bighom CrudeTank APEN- Hebron.doc

#### AIR POLLUTANT EMISSION NOTICE (APEN) & Application for Construction Permit - Crude Oil Storage Tank(s):

	Permit	Number:				Emissior	Source	AIRS ID:	1	
Section 05 -	- Stack Info	rmation (For Mid	lstream sites	only)		Section 06 –Stack	(Source,	if no combustion) I	ocation (Datum & eith	er Lat/Long or UTM)
Operator Stack ID No.	Stack Base Elevation (feet)	Stack Discharge Height Above Ground Level (feet)	Tomp. Flow ( (°F) (ACF		Moishire (%)	Herixontal Datum (NAD27, NAD83, WGS84)	UTM Zóne (12 or 13)	UTM Easting or Longitude (meters or degrees)	UTM Northing or Latitude (meters or degrees)	Method of Collection for Location Data (e.g. map. GPS, GoogleEarth)
						NAD83	***********************	-106.405131	40.58427	COGCC
Exhaust Oper		eek one): [] izo (check one): evice Information		Vertical with of nner Dizmeter (inche	62	/	ital ther: Length	Down (inches) =	Other (Describe). Width (inches) =	
***************************************	*************	iit (VRU) used for co	ntrol of the Stora	oe Tank(s)	IXI Com	bustion Device used for a	vantral of th	ne Starace Tenkts)	Ratin	g: 1.0 MMBtu/ls
Size:		Make/N		die a management	1	: (1) Enclosed Comb		Make/Model		S
	ated VOC & F	IAP Control Efficienc		9/c		& HAP Control Efficient		paested: 95 %		uaranteed: 98 %
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Descrip					§0000000000000000000000000000000000000	ribe Any Other:				
Section DS	Cac/Lioni	ds Separation Tect	malam: Inform	otion (E.C.D.C)+						
		o final separator vess:				psíz				
					********	ream flows from wellhea	d ta boater	trantor to starona ta	st. s	
		Inventory Inform		*******				27.2007 (0 21270 21 111	74.00	
		umentation attached				ow & throughput in Sec. 84	G. w. 2002A-	2016		
K-7 - 1221200	***************************************	Emission	***************************************	F	***********************	Cear Emission <sup>2</sup>	(10.7%, 4.740.13)	Requested Permi	**************************************	r
Poll	utant	Uncontrolled Basis	Units	Uncontrolled (1		Controlled (Tons/Year)	Elman	requested remainstrolled (Tons/Year)	Controlled (Tons/Yea	Emission Factor Data Source
		0.968	lbs/MMBtu	N/A	ORN I Car	1.06	CHOO	N/A	1.27	AP-42
 V(	***************************************	7.255	lbs/bbl	667.5	,	33.38		801.89	40,05	BRE ProMax
·····	0	0.310	lbs/MMBtu	<b></b>	<i>i</i>	4.84			ļ	AP-42
		*************************************	-	N/A				N/A	5.81	
	Zene	0.008	lbs/bbi	9,75		0.04		0,90	0.04	BRE ProMax
Toh	***************************************	0.007	lbs/bbl	8.63		0.03		0.76	0.04	BRE ProMax
	enzene	0.0013	lbs/bbl	0.12		0.01		0.15	0.01	BRE ProMax
	0.0003	0.003	lbs/bbl	0.24		10.0		0.29	0.01	BRE ProMax
n-He		0.083	lbs/bbl	7.61		0.38		9,13	0.46	BRE ProMax
2,2,4-Trime	thylpentane	NA NA	lbs/bbl	NA NA		NA r Poliniani Addendum fern		NA	NA	BRE ProMax
coverage was Signature of Y You may	erson Legalithe charged an emissions fees V	ermin CP08, I furthe y Authorized to Suppl additional APEN fee if a vill be based on actual er Attach a pressurized	r certify that thi y Data APEN is filled out i pissions reported hi pre-flash crude oil c	s source is and wi 7-23 Date neocreetly or missing ere extended liquids anal	H be operate	d in full compliance with  Dale Birdwell  Name of Legally 2	a each cone Authorized	tition of general pern Person (Please print)		
Required:		Attach EPA TANKS	emission analysis i	femission estimates	de not contain	working/breatling losses		Check box to request	copy of deast permit prior t	o public notice.
FORM	APCD.2	11)				Page 2 of 2			Bighorn	CrodeTank APEN- Hebron o

# Exhibit 4





September 21, 2016

Colorado Department of Public Health and Environment APCD-SS-B1 4300 Cherry Creek Drive South Denver, CO 80246-1530

RE: Bighorn Pad Kaizen Package and APEN Submittal SandRidge Exploration and Production, LLC

To Whom it May Concern:

LT Environmental, Inc. (LTE) is submitting on behalf of SandRidge Exploration and Production, LLC (SandRidge) the attached permit application for emissions sources at the Bighorn Pad production facility. The Bighorn Pad production facility is owned and operated by SandRidge and is located in the NWNW of Section 17, Township 7 North, Range 80 West in Jackson County, Colorado. There are two wells currently producing to a temporary facility named the "Little Horn Pad." A permit application or the temporary Little Horn Pad facility has been filed separately. After construction of the Bighorn Pad is complete, production will transition from the Little Horn Pad to the Bighorn Pad. Both facilities are being permitted concurrently, and the temporary facility permits may be cancelled after the transition occurs. Two wells will begin flowing directly to the Bighorn Pad, the first of which began production on June 23, 2016.

All produced gas will be routed to an enclosed flare on location and is controlled. SandRidge requests a permit condition to allow for 98% destruction efficiency for produced gas flaring. Site specific oil and gas analyses were recently collected from one of the wells associated with this facility and were utilized in the emissions calculations for this source. Please find attached an APEN summarizing the emissions for natural gas flaring; a site-specific permit is requested for this source. An Operating and Maintanence (O&M) Plan has been included in this application package for this source.

Storage tanks at this facility will be controlled upon startup using an enclosed VOC combustor and will be controlled by 95%. Site-specific oil samples were collected from one of the wells associated with this facility and the emissions were estimated using BRE ProMax (including flashing, working and breathing emissions). Emissions are estimated to exceed the control threshold of 6 TPY VOC; therefore the existing combustor will remain in place. Please find attached the APEN for this emissions source. SandRidge requests issuance of an individual permit for the crude oil tanks at this facility. An Operating and Maintanence (O&M) Plan has been included in this application package for this source.

Produced water tank emissions were estimated using State approved emission factors, and are estimated to exceed the control threshold of 6 TPY VOC; therefore these tanks will be controlled. This source is both APEN and permit required; SandRidge therefore requests



issuance of an individual permit for these storage tanks. The APEN and calculations are included in this submittal. An Operating and Maintanence (O&M) Plan has been included in this application package for this source.

Crude oil loadout emissions were estimated using the emission factors provided by the APCD. Please find attached the APEN for this emissions source. SandRidge requests the issuance of an individual permit for this source.

There is anticipated to be a gas lift compressor powered by a natural gas engine used to lift fluids from the wellhead to the production equipment. This engine is being permitted separately under the permit application for the Little Horn Pad, and an APEN for this source has been filed with the APCD. As the emissions from this engine will likely be aggregated with the BigHorn Pad after the temporary facility is removed, the anticipated emissions from this engine are accounted for on Form APCD-102 but no additional APEN is included.

Fugitive emissions were estimated using EPA Table 2-8, as is allowed for facilities subject to the LDAR requirements of Regulation 7. Based on the use of these factors, fugitive emissions are APEN and Permit exempt. Calculations regarding this source, as well as other exempt sources, are included in this submittal.

Included with this submittal is a check in the amount of \$611.60 for the four (4) APEN filing fees associated with this application.

Please find attached all necessary calculations and forms. If you have any questions or need additional information, please do not hesitate to contact me at (303) 962-5559 or by email at cdimarco@ltenv.com.

Sincerely.

LT ENVIRONMENTAL, INC.

Chris DiMarco

Project Air Quality Scientist

Attachments

ce: Dale Birdwell - SandRidge Exploration and Production, LLC

Form APCD-100

### Colorado Department of Public Health and Environment Air Pollution Control Division



# Oil & Gas Industry Construction Permit Application Completeness Checklist

Ver. November 29, 2012 Company Name: SandRidge Exploration and Production, LLC Source Name: Bighorn Pad September 2016 Date: Yes No X Are you requesting a facility wide permit for multiple emissions points? In order to have a complete application, the following attachments must be provided, unless stated otherwise. If application is incomplete, it will be returned to sender and filing fees will not be refunded. Attachment APCD **Application Element** Applicant  $\boxtimes$ **APEN Filing Fees** A Air Pollutant Emission Notice(s) (APENs) & X B Application(s) for Construction Permit(s) – APCD Form Series 200 X C **Emissions Calculations and Supporting Documentation** 冈 D Company Contact Information - Form APCD-101 X E Ambient Air Impact Analysis Check here if source emits only VOC (Attachment E not required)  $\boxtimes$ F Facility Emissions Inventory – Form APCD-102 Check here if single emissions point source (Attachment F not required) Process description, flow diagram and plot plan of emissions unit and/or  $\boxtimes$ G facility Check here if single emissions point source (Attachment G not required)  $\boxtimes$ H Operating & Maintenance (O&M) Plan – APCD Form Series 300 Check here if true minor emissions source or application is for a general permit (Attachment H not required) I Regulatory Analysis Check here to request APCD to complete regulatory analysis X (Attachment I not required) Colorado Oil and Gas Conservation Commission (COGCC) 805 Series Rule J П Requirements-Form APCD-105 Check here if source is not subject to COGCC 805 Series requirements X (Attachment J not required) Send **Complete** Application to: Colorado Department of Public Health & Environment APCD-SS-B1 4300 Cherry Creek Drive South Denver, Colorado 80246-1530 Check box if facility is an existing Title V source: Send an additional application copy Check box if refined modeling analysis included: Send an additional application copy Check box if application is for major NA NSR or PSD permit: Send eight (8) total application copies

Section VI.C)

#### Colorado Department of Public Health and Environment Air Pollution Control Division



#### **Company Contact Information Form**

Ver. September 10, 2008

Company Na	me: SandRid	ge Ex	ploration	and Prodution, L	LC		
Source Name	Bighorn	Pad					
Permit Contact <sup>1</sup> :	Dale Birdwell			Compliance Contact <sup>2</sup> :	Dale Birdwell	gannonina de la composición dela composición de la composición de la composición de la composición dela composición de la composición de la composición dela composición dela composición de la	
Contact:	123 Robert S. Ker	r Aveni	ıe	Contact:	123 Robert S. Ker	т Aven	ue
Address:	Street			Address:	Street		
Address:	Oklahoma City	ОК	73102	Address:	Oklahoma City	ОК	73102
	City	State	Zip		City	State	Zip
Phone Number:	405.429.5562			Phone Number:	405.429.5562		
Fax Number:				Fax Number:			
E-mail:	dbirdwell@sandri	dgeene	rgy.com	E-mail:	dbirdwell@sandri	dgeene	rgy.com
Billing Contact: (Permit Fees)3	Dale Birdwell			Billing Contact: (Annual Fees)4	Dale Birdwell		
	123 Robert S. Ke	rr Aver	nue		123 Robert S. K	err Ave	enue
Address:	Street			Address:	Street		
	Oklahoma City	OK	73102	11441000	Oklahoma City		
	City	State	Zip		City	Stat	e Zip
Phone Number:	405.429.5562			Phone Number:	405.429.5562		
Fax Number:				Fax Number:			
E-mail:	dbirdwell@sandr	idgeene	ergy.com	E-mail:	dbirdwell@sand	dridgeer	nergy.com
Check how would	d you like to receive E-ma	_	_	voice?			
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Page 1 of 1

annual basis for fees associated with actual emissions reported on APENs for the facility. (Reg. 3, Part A,

Bighorn Company Contact Info.doc

Form APCD-102

#### Cularado Department of Public Health and Environment Air Pullution Control Division

#### Facility Wide Emissions Inventory Form



Company Name: South decision and Friction at LLC Source Name: High-on Fol Source ARS 10: Product Ton Source

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Page 1 of 1 9/16/2016 Company Wome



# Air Pollution Control Division Operating and Maintenance Plan Template for Separators<sup>1</sup>

Ver. August 22, 2016

<sup>1</sup> This term "separators" is intended throughout to include two-phase separators, three-phase separators, high/low pressure separators, heater-treaters, vapor recovery towers, etc., and the associated air pollution control equipment.

The Air Pollution Control Division (Division) developed this Operating and Maintenance Plan (O&M Plan) for separator(s) that use emissions controls, permitted at synthetic minor and major oil and gas facilities in the State of Colorado. An O&M Plan shall be submitted with the permit application when required. One O&M Plan may be used for multiple separators at one facility if each are controlled and monitored in the same manner.

If the O&M Plan template is completed correctly, the Division will approve the O&M Plan and a construction permit will be issued with the requirement to follow the O&M Plan as submitted. If the template is not completed correctly, the Division will work with the operator to make corrections. Once a construction permit is issued, the facility operator must comply with the requirements of the O&M Plan upon commencement of operation. An existing approved O&M Plan may be modified without a permit modification or permit reissuance, but the operator must adhere to the requirements of the existing approved O&M Plan until an approval letter is issued for the new O&M Plan.

The operator is required to use the Division-developed O&M Plan template forms in order to meet minimum expectations within a standard, organized format. Do not modify the structure and/or content of this template.

If the facility or equipment is subject to other state or federal regulations with duplicative requirements, the operator shall follow the most stringent regulatory requirement.

For sources that are subject to the Title V Operating Permits program: in accordance with Colorado Regulation No. 3, Part C, Section V.C.5., some or all of the monitoring specified in this O&M plan will be incorporated as specific conditions in the source's Operating Permit, and in some cases permit limits will be established for certain operational parameters.

Submittal Date:	9/21/2016				
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Company Name:	SandRidge Ex Production, L	xploration and LC	Facility Location:	NWNW Sec 17 T7	N R80W
Facility Name:	Bighorn Pad		Facility AIRS ID (for	existing facilities)	-
		Emission Un	its Covered by this O&	M form	
Facility Equipme	ent ID	Flare-1			
Permit Number				000000000000000000000000000000000000000	
AIRS Point ID		002000000000000000000000000000000000000		<u> </u>	

	APCD Internal Us	e Only	
Approved?	Initial	Date	



#### Section 2 - Maintenance Schedules

Check	one of the following:
$\boxtimes$	Facility shall follow manufacturer recommendations for the operation and maintenance of the emissions unit and control devices. These schedules and practices, as well as all maintenance records showing compliance with these recommendations, shall be made available to the Division upon request.
	Facility shall follow individually developed maintenance practices and schedules for the operation and maintenance of equipment and control devices. These schedules and practices, as well as all maintenance records showing adherence to these practices, shall be made available to the Division upon request and shall be consistent with good air pollution control practices for minimizing emissions as defined in the New Source Performance Standard (NSPS) general conditions.

Confirm the following requirement, if the separator has a pressure relief valve (PRV):

The operator shall inspect the separator pressure relief valve (PRV) at a minimum once every calendar year. The inspection shall include a check that the PRV set point is adequate to ensure that emissions are routed to the emissions control device during normal operation. Records of these inspections, and any repairs, shall be made available to the Division upon request.

#### Section 3 - Recordkeeping Requirements

The following box must be checked for the O&M Plan to be considered complete:

Synthetic minor and major sources are required to maintain maintenance and monitoring records for the requirements of this O&M Plan for a period of five (5) years. If applicable state requirements or any Federal NSPS, NESHAP, or MACT require a longer record retention period, the operator must comply with the longest record retention requirement.



#### **Section 4 - Monitoring Requirements**

#### **Process Equipment Information**

The following boxes must be checked for the O&M Plan to be considered complete:

 $\boxtimes$ 

Attach a diagram or plot plan of the configuration of the separator(s), control device(s), and vapor recovery unit(s), <u>as well as</u> the location(s) of flow meters. This diagram is required in addition to the facility-wide diagram required for new permit applications. This diagram shall be retained with the O&M Plan for reference by the operator and Division inspector.

The permit requires calculation and recordkeeping of actual emissions from this source, but the calculation methods are not incorporated into the permit. In the space below, describe the formulas used to calculate the volume of gas vented from the separator and sent to the control device, using data from the meter if required. If using a vapor recovery tower (VRT), describe the method used to calculate the volume of gas vented from the VRT.

#### Examples:

Flow meter at enclosed flare directly measures the volume of gas sent to flare from a single separator.

Volume from low pressure separator sent to control device = (Metered volume through high pressure separator) - (Metered volume through low pressure separator) OR

Volume vented from VRT = (Total gas volume metered at flare) - (Metered volume to flare from low pressure separator) - (Volume to flare from tanks)

OR etc.

Please be clear and specific about the sources of input data, and describe how the input data is collected and recorded. Attach additional pages if needed.

Flow meter at separator measures total gas produced to the separator. As there is currently no pipeline, all produced gas at this location is metered and routed to the enclosed flare.

Flare HAP and VOC pollutants are calculated using the following equations:

Pollutant Venting Rate (MSCFD) = (production rate(scf/d) \* pollutant mol%)/1000

Pollutant Venting Rate (lb/hr) = pollutant molecular weight (lb/lb-mol) \* 1000/24/379.49 x venting rate (MSCFD)

NOx and CO emissions are calculated using the following equations:

NOx emission factor = 0.068 lb/MMBtu CO emission factor = 0.31 lb/MMBtu

Emissions (TPY)= (NOx or CO factor \* Fuel Heating Value (BTU/scf) \* Fuel Useage (MMscf/yr) ) / 2000





#### **Control Equipment Information**

Table 1 below details the monitoring parameters and frequency for control equipment depending on the type of control equipment and the requested permitted emissions at the facility. Indicate the separator emissions control by checking the appropriate boxes. In addition, check the appropriate box for "Monitoring Frequency" based on the facility-wide permitted VOC emissions.

			Table 1	·	
Emissions Control or Recycling Method Primary Backup		Parameter	Monitorin	g Frequency Permitted Facility Emissions < 80 tpy VOC	
Enclosed Flare or		П	Pilot Light and Auto- igniter Monitoring <sup>b</sup>	Daily	Weekly
Combustor		⊔	Visible Emissions Observation <sup>c</sup>	Daily	Weekly
Elevated Open			Pilot Light and Auto- igniter Monitoring <sup>b</sup>	Daily	Weekly
Flare <sup>a</sup>			Visible Emissions Observation <sup>c</sup>	Daily	Weekly
Vapor Recovery Unit (VRU) or Recycled or Closed Loop System <sup>d</sup>			Monitoring requirements, including parameters and frequency, to be determined by the operator and listed below, and approved by the Division		
Other			Monitoring requirements including specific parameters and frequency to be determined by the operator and described in Section 5 below, and approved by the Division		

#### a Elevated Open Flare

An open flare permitted after May 1, 2014 and used to comply with Regulation No. 7 Section XVII must be approved by the Division as an alternate emission control device prior to operation, in accordance with Regulation No. 7 Section XVII.B.2.e.; see PS Memo 15-03.

#### <sup>b</sup> Pilot Light Monitoring Options

If emissions are controlled by flare or combustor, then the operator must indicate in Table 2 the method by which the presence of a pilot light will be monitored. One primary method for Pilot Light Monitoring must be checked and, optionally, up to two backup methods may be checked.

	Table 2: Pilot Light Monitoring			
Primary	Back-up	Monitoring Method		
$\boxtimes$		Visual Inspection		
	Optical Sensor			
		Auto-Igniter Signal		
		Thermocouple		

#### c Visible Emissions Observation and Method 22 Options

At the frequency specified in Table 1, the operator is required to conduct an inspection of the subject combustion device for the presence or absence of smoke (e.g., visible emissions). If smoke is observed during the visible emissions inspection the operator has the option to either (1) immediately shut-in the equipment to



investigate the cause of the smoke, conduct any necessary repairs, and maintain records of the specific repairs completed; or (2) conduct a formal Method 22 observation to determine whether visible emissions (as defined per Regulation No. 7, Section XVII.A.16.) are present.

If a Method 22 is conducted, the record of the observations shall be maintained as required in Section 3 of this O&M Plan (Reference: Regulation No. 7, Section XVII.C.3.d). If visible emissions are observed by Method 22, the operator shall immediately conduct any necessary repairs and maintain records of the specific repairs completed; if repair cannot be immediately completed, the operator shall shut-in the equipment, conduct any necessary repairs, and maintain records of the specific repairs completed.

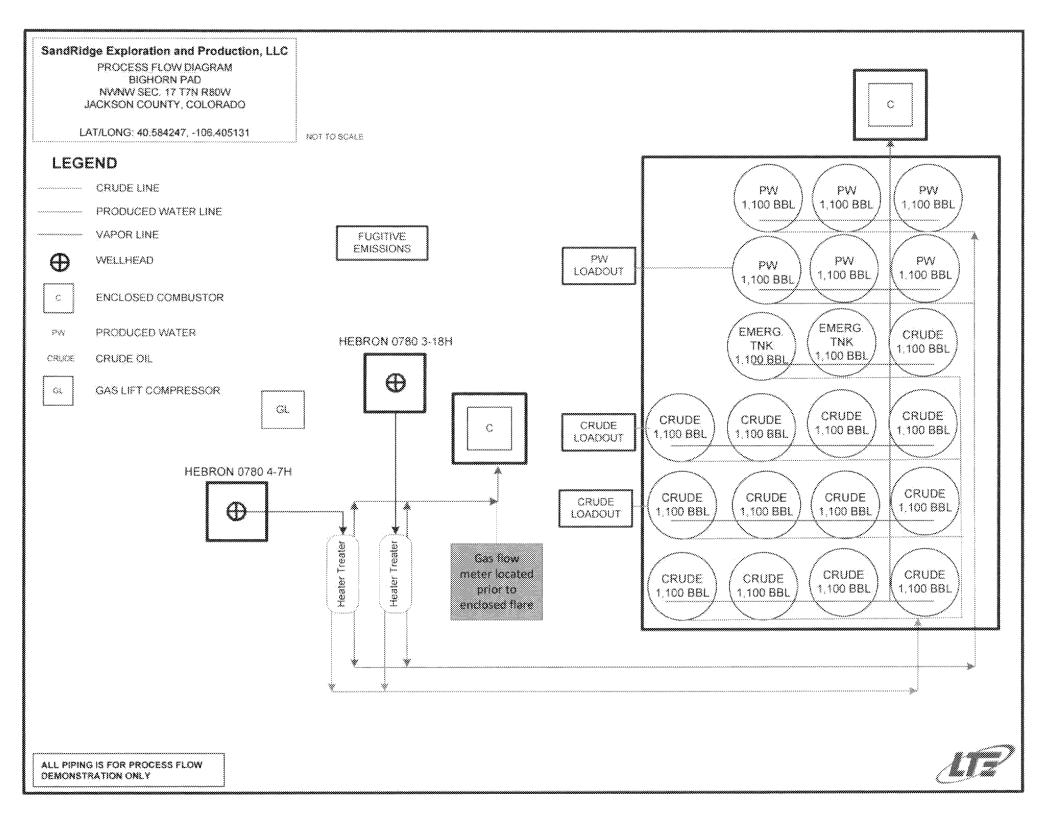
If the equipment is subject to Regulation No. 7, Section XII.E, operators must document the required inspections for the presence or absence of smoke. The Division has historically approved a "check box" to satisfy the documentation procedures referenced in Section XII. The Division will continue to accept the "check box" recordkeeping format in instances where no visible emissions are observed in order to demonstrate compliance with Regulation No. 7 Section XII.E.4.a.

If a flare is not subject to Regulation No. 7 requirements (as described in the permit), a similar approach may be employed where the operator may conduct an inspection for presence or absence of smoke, and if smoke is observed the operator has the option to (1) immediately conduct repairs and maintain records of the specific repairs completed; (2) shut-in the equipment to investigate the cause of the smoke, conduct any necessary repairs, and maintain records of the specific repairs completed; or (3) conduct a formal Method 9 observation to determine the opacity of the visible emissions, and conduct repairs if necessary.

## <sup>d</sup> Vapor Recovery Unit (VRU) or Recycled or Closed Loop System In the space provided below, please provide a brief description of the emission control or recycling system, including an explanation of parameters monitored, monitoring frequency, and how the system design ensures that emissions are being routed to the appropriate system at all times, or during all permitted runtime. Also, provide a description of how downtime is tracked and recorded. Attach additional pages if necessary.

#### Section 5 - Additional Notes and O&M Activities

Please use this section to describe any additional notes or operation and maintenance activities, or if additional space is needed from a previous section. Attach additional pages if necessary.





# Air Pollution Control Division Operating and Maintenance Plan Template for Crude Oil Storage Tanks

Ver. August 22, 2016

The Air Pollution Control Division (Division) developed this Operating and Maintenance Plan (O&M Plan) for crude oil storage tanks that use emissions controls, permitted at synthetic minor and major oil and gas facilities in the State of Colorado. An O&M Plan shall be submitted with the permit application when required. One O&M Plan may be used for multiple tanks at one facility if each are controlled and monitored in the same manner.

If the O&M Plan template is completed correctly, the Division will approve the O&M Plan and a construction permit will be issued with the requirement to follow the O&M Plan as submitted. If the template is not completed correctly, the Division will work with the operator to make corrections. Once a construction permit is issued, the facility operator must comply with the requirements of the O&M Plan upon commencement of operation. An existing approved O&M Plan may be modified without a permit modification or permit reissuance, but the operator must adhere to the requirements of the existing approved O&M Plan until an approval letter is issued for the new O&M Plan.

The operator is required to use the Division-developed O&M Plan template forms in order to meet minimum expectations within a standard, organized format. Do not modify the structure and/or content of this template.

If the facility or equipment is subject to other state or federal regulations with duplicative requirements, the operator shall follow the most stringent regulatory requirement.

For sources that are subject to the Title V Operating Permits program: in accordance with Colorado Regulation No. 3, Part C, Section V.C.5., some or all of the monitoring specified in this O&M plan will be incorporated as specific conditions in the source's Operating Permit, and in some cases permit limits will be established for certain operational parameters.

Submittal Date:	9/21/2016						
Section 1 - Sou For new permits soutime of application.	me of this info	rmation (i.e., Facil				int ID) may not	be known at the
Company Name:	SandRidge E Production, I	xploration and LLC.	Facil	ity Location:	NWNW Sec	17 T7N R80W	
Facility Name:	Bighorn Pad		Facili	ty AIRS ID (for	existing faciliti	ies)	-
		Emission Un	its Covere	d by this O&/	M form		
Facility Equipm	ent ID	Oil Tanks	All Militeria e e e e e e e e e e e e e e e e e e e	niskisinnalikanneesinnasiillaanseennasiillika			
Permit Number							
AIRS Point ID							

	·		
APO	CD Internal U	se Only	Pa
Approved?	Initial	Date	_



#### Section 2 - Maintenance Schedules

Check one of the following:

$\boxtimes$	Facility shall follow manufacturer recommendations for the operation and maintenance of the emissions unit and control devices. These schedules and practices, as well as all maintenance records showing compliance with these recommendations, shall be made available to the Division upon request.
	Facility shall follow individually developed maintenance practices and schedules for the operation and maintenance of equipment and control devices. These schedules and practices, as well as all maintenance records showing adherence to these practices, shall be made available to the Division upon request and shall be consistent with good air pollution control practices for minimizing emissions as defined in the New Source Performance Standard (NSPS) general conditions.

#### Section 3 - Recordkeeping Requirements

The following box must be checked for the O&M Plan to be considered complete:

Synthetic minor and major sources are required to maintain maintenance and monitoring records for the requirements of this O&M Plan for a period of five (5) years. If applicable state requirements or any Federal NSPS, NESHAP, or MACT require a longer record retention period, the operator must comply with the longest record retention requirement.

#### **Section 4 - Monitoring Requirements**

Check one of the following two boxes:

×	Check this box to confirm that the storage vessel(s) are subject to the requirements of Regulation No. 7, Sections XVII.C.2. and C.3. By checking this box, the operator confirms adherence to the operating, maintenance, and recordkeeping requirements of the Storage Tank Emission Management System ("STEM") as developed and implemented by the operator, as required by Regulation No. 7, Sections XVII.C.2. and C.3.
	<ul> <li>Check this box if the storage vessel(s) are not subject to the requirements of Regulation No. 7, Sections XVII.C.2. and C.3. ("STEM"). Leakage to the atmosphere shall be minimized as follows:</li> <li>Thief hatch seals shall be inspected monthly for integrity and replaced as necessary;</li> <li>Thief hatch covers shall be properly weighted and seated to ensure flashing, working, and breathing losses (as applicable) are routed to the control device under normal operating conditions;</li> <li>Pressure relief valves (PRV) shall be inspected monthly for proper operation and repaired or replaced as necessary;</li> <li>PRVs shall be set to release at a pressure that will ensure flashing, working, and breathing losses (as applicable) are routed to the control device under normal operating conditions; and</li> <li>Inspections shall be documented with an indication of status, a description of any problems found, and their resolution (e.g., adjustments made to thief hatch weight cover weight or PRV setpoint, including the modified settings).</li> </ul>



Table 1 below details the monitoring parameters and frequency for control equipment depending on the type of control equipment and the requested permitted emissions at the facility. Indicate the storage tank emissions control by checking the appropriate boxes. In addition, check the appropriate box for "Monitoring Frequency" based on the facility-wide permitted VOC emissions.

		Table 1		
Emissions Control			Monitorin	g Frequency
or Recycling Method		Parameter	Permitted Facility Emissions ≥ 80 tpy VOC	Permitted Facility Emissions < 80 tpy VOC
Enclosed Flare or Combustor	$\boxtimes$	Pilot Light and Auto-igniter Monitoring <sup>b</sup>	Daily	Weekly
Compastor		Visible Emissions Observation <sup>c</sup>	Daily	Weekly
Elevated Open Flare <sup>a</sup>		Pilot Light and Auto-igniter Monitoring <sup>b</sup>	Daily	Weekly
•		Visible Emissions Observation c	Daily	Weekly
Vapor Recovery Unit (VRU) or Recycled or Closed Loop System <sup>d</sup>		Monitoring requirements, including by the operator and listed below, as		
Other		Monitoring requirements including specific parameters and frequency to be determined by the operator and described in Section 5 below, and approved by the Division		

#### <sup>a</sup> Elevated Open Flare

If the storage tank is subject to Regulation No. 7, Section XII or Section XVII, the use of an open flare must be approved by the Division as an alternate emission control device prior to operation in accordance with Regulation No. 7 Section XVII.B.2.e.; see PS Memo 15-03. Open flares permitted prior to May 1, 2014 are approved for operation. All new open flares permitted on or after May 1, 2014 are required to obtain Division approval prior to operation.

#### <sup>b</sup> Pilot Light Monitoring Options

If the tanks are controlled by flare or combustor, then the operator must indicate in Table 2 the method by which the presence of a pilot light will be monitored. One primary method for Pilot Light Monitoring must be checked and, optionally, up to two backup methods may be checked.

	Table 2: Pilot Light Monitoring					
Primary	Primary Back-up Monitoring Method					
$\square$		Visual Inspection				
		Optical Sensor				
		Auto-Igniter Signal				
		Thermocouple				

#### c Visible Emissions Observation and Method 22 Options

At the frequency specified in Table 1, the operator is required to conduct an inspection of the subject combustion device for the presence or absence of smoke (e.g., visible emissions). If smoke is observed during the visible emissions inspection the operator has the option to either (1) immediately shut-in the equipment to investigate the cause of the smoke, conduct any necessary repairs, and maintain records of the specific repairs completed; or (2) conduct a formal Method 22 observation to determine whether visible emissions (as defined per Regulation No. 7, Section XVII.A.16.) are present.



If a Method 22 is conducted, the record of the observations shall be maintained as required in Section 3 of this O&M Plan (Reference: Regulation No. 7, Section XVII.C.3.d). If visible emissions are observed by Method 22, the operator shall immediately conduct any necessary repairs and maintain records of the specific repairs completed; if repair cannot be immediately completed, the operator shall shut-in the equipment, conduct any necessary repairs, and maintain records of the specific repairs completed.

<sup>d</sup> Vapor Recovery Unit (VRU) or Recycled or Closed Loop System In the space provided below, please provide a brief description of the emission control or recycling system, including an explanation of parameters monitored, monitoring frequency, and how the system design ensures that emissions are being routed to the appropriate system at all times, or during all permitted runtime. Also, provide a description of how downtime is tracked and recorded.

#### Section 5 - Additional Notes and O&M Activities

Please use this section to describe any additional notes or operation and maintenance activities, or if additional space was required from a previous section. Attach additional pages if necessary.



# Air Pollution Control Division Operating and Maintenance Plan Template for Produced Water Storage Tanks

Ver. August 22, 2016

The Air Pollution Control Division (Division) developed this Operating and Maintenance Plan (O&M Plan) for produced water storage tanks that use emissions controls, permitted at synthetic minor and major oil and gas facilities in the State of Colorado. An O&M Plan shall be submitted with the permit application when required. One O&M Plan may be used for multiple tanks at one facility if each are controlled and monitored in the same manner.

If the O&M Plan template is completed correctly, the Division will approve the O&M Plan and a construction permit will be issued with the requirement to follow the O&M Plan as submitted. If the template is not completed correctly, the Division will work with the operator to make corrections. Once a construction permit is issued, the facility operator must comply with the requirements of the O&M Plan upon commencement of operation. An existing approved O&M Plan may be modified without a permit modification or permit reissuance, but the operator must adhere to the requirements of the existing approved O&M Plan until an approval letter is issued for the new O&M Plan.

The operator is required to use the Division-developed O&M Plan template forms in order to meet minimum expectations within a standard, organized format. Do not modify the structure and/or content of this template.

If the facility or equipment is subject to other state or federal regulations with duplicative requirements, the operator shall follow the most stringent regulatory requirement.

For sources that are subject to the Title V Operating Permits program: in accordance with Colorado Regulation No. 3, Part C, Section V.C.5., some or all of the monitoring specified in this O&M plan will be incorporated as specific conditions in the source's Operating Permit, and in some cases permit limits will be established for certain operational parameters.

Submittal Date:	9/21/2016						
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Section 1 - Sou For new permits son time of application.	me of this info	rmation (i.e., Fac			•	nt ID) may not	be known at the
Company Name:	SandRidge E Production, I	exploration and LLC.	Facil	ity Location:	NWNW Sec	17 T7N R80W	
Facility Name:	Bighorn Pad		Facili	ty AIRS ID (for	existing facilitie	es)	B
		Emission U	nits Covere	d by this O&	M form		1
Facility Equipme	ent ID	Water					
		Tanks					
Permit Number							
AIRS Point ID							

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Approved?	П	Initial	Date	
				************************



#### **Section 2 - Maintenance Schedules**

Check	one of the following:
$\boxtimes$	Facility shall follow manufacturer recommendations for the operation and maintenance of the emissions unit and control devices. These schedules and practices, as well as all maintenance records showing compliance with these recommendations, shall be made available to the Division upon request.
	Facility shall follow individually developed maintenance practices and schedules for the operation and maintenance of equipment and control devices. These schedules and practices, as well as all maintenance records showing adherence to these practices, shall be made available to the Division upon request and shall be consistent with good air pollution control practices for minimizing emissions as defined in the New Source Performance Standard (NSPS) general conditions.
	on 3 - Recordkeeping Requirements  ollowing box must be checked for the O&M Plan to be considered complete:
	Synthetic minor and major sources are required to maintain maintenance and monitoring records for the requirements of this O&M Plan for a period of five (5) years. If applicable state requirements or any Federal NSPS, NESHAP, or MACT require a longer record retention period, the operator must comply with the longest record retention requirement.
	on 4 - Monitoring Requirements one of the following two boxes:
$\boxtimes$	Check this box to confirm that the storage vessel(s) are subject to the requirements of Regulation No. 7, Sections XVII.C.2. and C.3. By checking this box, the operator confirms adherence to the operating, maintenance, and recordkeeping requirements of the Storage Tank Emission Management System ("STEM") as developed and implemented by the operator, as required by Regulation No. 7, Sections XVII.C.2. and C.3.
	<ul> <li>Check this box if the storage vessel(s) are not subject to the requirements of Regulation No. 7, Sections XVII.C.2. and C.3. ("STEM"). Leakage to the atmosphere shall be minimized as follows:</li> <li>Thief hatch seals shall be inspected monthly for integrity and replaced as necessary;</li> <li>Thief hatch covers shall be properly weighted and seated to ensure flashing, working, and breathing losses (as applicable) are routed to the control device under normal operating conditions;</li> <li>Pressure relief valves (PRV) shall be inspected monthly for proper operation and repaired or replaced as necessary;</li> <li>PRVs shall be set to release at a pressure that will ensure flashing, working, and breathing losses (as applicable) are routed to the control device under normal operating conditions; and</li> <li>Inspections shall be documented with an indication of status, a description of any problems found, and their resolution (e.g., adjustments made to thief hatch weight cover weight or PRV setpoint, including the modified settings).</li> </ul>



Table 1 below details the monitoring parameters and frequency for control equipment depending on the type of control equipment and the requested permitted emissions at the facility. Indicate the storage tank emissions control by checking the appropriate boxes. In addition, check the appropriate box for "Monitoring Frequency" based on the facility-wide permitted VOC emissions.

		Table 1		20 4 - Angles (20 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 - 1920 -
Emissians Cambral			Monitorin	g Frequency
Emissions Control or Recycling Method		Parameter	Permitted Facility Emissions ≥ 80 tpy VOC	Permitted Facility Emissions < 80 tpy VOC
Enclosed Flare or Combustor	Ø	Pilot Light and Auto-igniter Monitoring <sup>b</sup>	Daily	Weekly
Compustor	S30	Visible Emissions Observation c	Daily	Weekly
Elevated Open Flare a		Pilot Light and Auto-igniter Monitoring <sup>b</sup>	Daily	Weekly
•		Visible Emissions Observation <sup>c</sup>	Daily	Weekly
Vapor Recovery Unit (VRU) or Recycled or Closed Loop System <sup>d</sup>		Monitoring requirements, including by the operator and listed below, as		
Other		Monitoring requirements including specific parameters and frequency to be determined by the operator and described in Section 5 below, and approved by the Division		

#### <sup>a</sup> Elevated Open Flare

If the storage tank is subject to Regulation No. 7, Section XII or Section XVII, the use of an open flare must be approved by the Division as an alternate emission control device prior to operation in accordance with Regulation No. 7 Section XVII.B.2.e.; see PS Memo 15-03. Open flares permitted prior to May 1, 2014 are approved for operation. All new open flares permitted on or after May 1, 2014 are required to obtain Division approval prior to operation.

#### <sup>b</sup> Pilot Light Monitoring Options

If the tanks are controlled by flare or combustor, then the operator must indicate in Table 2 the method by which the presence of a pilot light will be monitored. One primary method for Pilot Light Monitoring must be checked and, optionally, up to two backup methods may be checked.

Table 2: Pilot Light Monitoring		
Primary	Back-up	Monitoring Method
$\boxtimes$		Visual Inspection
		Optical Sensor
-		Auto-Igniter Signal
		Thermocouple

#### <sup>c</sup> Visible Emissions Observation and Method 22 Options

At the frequency specified in Table 1, the operator is required to conduct an inspection of the subject combustion device for the presence or absence of smoke (e.g., visible emissions). If smoke is observed during the visible emissions inspection the operator has the option to either (1) immediately shut-in the equipment to investigate the cause of the smoke, conduct any necessary repairs, and maintain records of the specific repairs completed; or (2) conduct a formal Method 22 observation to determine whether visible emissions (as defined per Regulation No. 7, Section XVII.A.16.) are present.



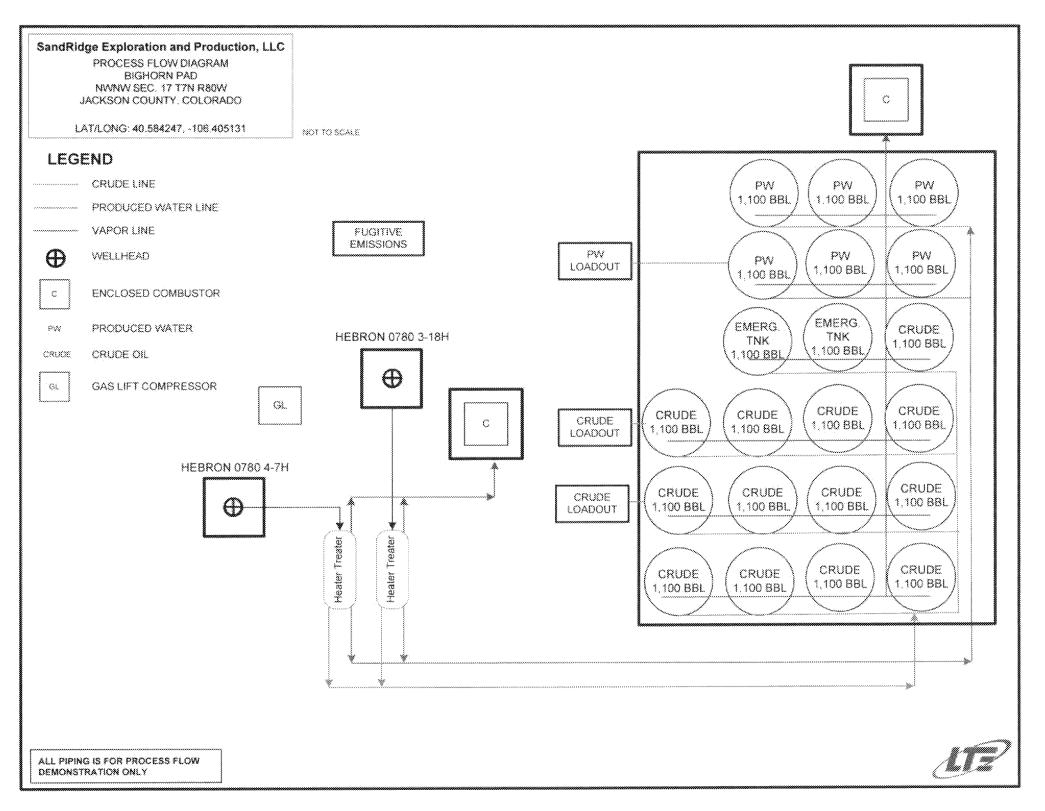
If a Method 22 is conducted, the record of the observations shall be maintained as required in Section 3 of this O&M Plan (Reference: Regulation No. 7, Section XVII.C.3.d). If visible emissions are observed by Method 22, the operator shall immediately conduct any necessary repairs and maintain records of the specific repairs completed; if repair cannot be immediately completed, the operator shall shut-in the equipment, conduct any necessary repairs, and maintain records of the specific repairs completed.

<sup>d</sup> Vapor Recovery Unit (VRU) or Recycled or Closed Loop System In the space provided below, please provide a brief description of the emission control or recycling system, including an explanation of parameters monitored, monitoring frequency, and how the system design ensures that emissions are being routed to the appropriate system at all times, or during all permitted runtime. Also, provide a description of how downtime is tracked and recorded.

#### Section 5 - Additional Notes and O&M Activities

Please use this section to describe any additional notes or operation and maintenance activities, or if additional space was required for a previous section. Attach additional pages if necessary.

ATTACHMENT A
FLOW DIAGRAM



# ATTACHMENT B PROCESS DESCRIPTION

# SandRidge Exploration and Production, LLC

# Process Description Bighorn Pad NWNW Sec 17 T7N R80W

The facility is a multi-well oil and gas production facility, which produces sweet gas, crude oil, and produced water from two (2) wells. The commingled stream is assisted from the wellhead using a gas-lift compressor, powered by a 203 hp natural gas engine (this engine has been permitted separately). If the gas lift compressor is not used, an electric pumping unit will be used in its place. The production stream flows from wellheads to two heater-treaters.

From the heater-treater, the crude oil phase is directed to fifteen (15) 1,100-bbl crude oil storage tanks. The water phase is piped to six (6) 1,100 bbl produced water storage tanks. Hydrocarbon vapors are vented from the crude oil storage tanks and the produced water tanks to a smokeless combustor with a destruction efficiency of 95 percent. Crude oil and produced water are trucked out of the facility using tank trucks and submerge fill loading. All the natural gas from the heater-treater is currently being routed to a combustor and controlled by 98 percent.



# ATTACHMENT C FACILITY EQUIPMENT EMISSION CALCULATIONS

Company: Site:

SandRidge Exploration and Production, LLC Bighorn Pad

**TABLE 1: Uncontrolled PTE Emission Summary Sheet** 

	, N	O <sub>x</sub>	С	0	V	ос	Total	HAPs	P	M-10	SC	)2
Equipment	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Crude Oil Storage Tanks	n/a	n/a	n/a	n/a	182.90	801.09	2.56	11.22	n/a	n/a	n/a	n/a
Produced Water Storage Tanks	n/a	n/a	n/a	n/a	7.59	33.23	0.84	3.68	n/a	n/a	n/a	n/a
Truck Loadout	n/a	n/a	n/a	n/a	2.62	11.48	n/a	n/a	n/a	n/a	n/a	n/a
Elevated Flare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Natural Gas Engine (associated facility)	0.45	1.96	0.89	3.92	0.31	1.37	0.05	0.23	0.02	0.07	n/a	n/a
Heater-Treater Burners	0.38	1.67	0.32	1.40	0.02	0.09	n/a	n/a	0.03	0.13	n/a	n/a
Tank Combustor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Produced Gas Venting	n/a	n/a	n/a	n/a	412.55	1,806.95	8.90	38.99	n/a	n/a	n/a	n/a
Fugitive Emissions	n/a	n/a	n/a	n/a	0.04	0.16	0.00	0.01	n/a	n/a	n/a	n/a
Total PTE	0.83	3.63	1.21	5.32	606.02	2,654.38	12.36	54.12	0.04	0.20	0.00	0.00

**TABLE 2: Controlled PTE Emission Summary Sheet** 

	T N	O <sub>x</sub>		0:	V	oc	Total	HAPs	P	M-10	S	) <sub>2</sub>
Equipment	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Crude Oil Storage Tanks	n/a	n/a	n/a	n/a	9.14	40.05	0.13	0.56	n/a	n/a	n/a	n/a
Produced Water Storage Tanks	n/a	n/a	n/a	n/a	0.38	1.66	0.04	0.18	n/a	n/a	n/a	n/a
Truck Loadout	n/a	n/a	n/a	n/a	2.62	11.48	n/a	n/a	n/a	n/a	n/a	n/a
Elevated Flare	1.33	5.84	6.08	26.64	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Natural Gas Engine (associated facility)	0.22	0.98	0.45	1.96	0.31	1.37	0.05	0.23	0.02	0.07	n/a	n/a
Heater-Treater Burners	0.38	1.67	0.32	1.40	0.02	0.09	n/a	n/a	0.03	0.13	n/a	n/a
Tank Combustor	0.29	1.27	1.33	5.81	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Produced Gas Venting	n/a	n/a	n/a	n/a	8.25	36.14	0.18	0.78	n/a	n/a	n/a	n/a
Fugitive Emissions	n/a	n/a	n/a	n/a	0.04	0.16	0.00	0.01	n/a	n/a	n/a	n/a
Total PTE	2.23	9.77	8.17	35.80	20.77	90.96	0.40	1.76	0.04	0.20	0.00	0.00



**TABLE 3: Uncontrolled Actual Emission Summary Sheet** 

	N(	O <sub>x</sub>	C	0	V	ос	Total	HAPs	Р	M-10	S	<b>5₂</b>
Equipment	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Crude Oil Storage Tanks	n/a	n/a	n/a	n/a	152.41	667.57	2.13	9.35	n/a	n/a	n/a	n/a
Produced Water Storage Tanks	n/a	n/a	n/a	n/a	6.32	27.69	0.70	3.07	n/a	n/a	n/a	n/a
Truck Loadout	n/a	n/a	n/a	n/a	2.18	9.57	n/a	n/a	n/a	n/a	n/a	n/a
Elevated Flare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Natural Gas Engine (associated facility)	0.45	1.96	0.89	3.92	0.31	1.37	0.05	0.23	0.02	0.07	n/a	n/a
Heater-Treater Burners	0.38	1.67	0.32	1.40	0.02	0.09	n/a	n/a	0.03	0.13	n/a	n/a
Tank Combustor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Produced Gas Venting	n/a	n/a	n/a	n/a	343.26	1,503.49	7.41	32.44	n/a	n/a	n/a	n/a
Fugitive Emissions	n/a	n/a	n/a	n/a	0.04	0.16	0.00	0.01	n/a	n/a	n/a	n/a
Total PTE	0.83	3.63	1.21	5.32	504.56	2,209.95	10.29	45.09	0.04	0.20	0.00	0.00

**TABLE 4: Controlled Actual Emission Summary Sheet** 

	N	O <sub>x</sub>	C	0	V	ос	Total	<b>HAPs</b>	Р	M-10	S	<b>⊃</b> ₂
Equipment	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Crude Oil Storage Tanks	n/a	n/a	n/a	n/a	7.62	33.38	0.11	0.47	n/a	n/a	n/a	n/a
Produced Water Storage Tanks	n/a	n/a	n/a	n/a	0.32	1.38	0.03	0.15	n/a	n/a	n/a	n/a
Truck Loadout	n/a	n/a	n/a	n/a	2.18	9.57	n/a	n/a	n/a	n/a	n/a	n/a
Elevated Flare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Natural Gas Engine (associated facility)	0.22	0.98	0.45	1.96	0.31	1.37	0.05	0.23	0.02	0.07	n/a	n/a
Heater-Treater Burners	0.38	1.67	0.32	1.40	0.02	0.09	n/a	n/a	0.03	0.13	n/a	n/a
Tank Combustor	0.24	1.06	1.10	4.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Produced Gas Venting	n/a	n/a	n/a	n/a	6.87	30.07	0.15	0.65	n/a	n/a	n/a	n/a
Fugitive Emissions	n/a	n/a	n/a	n/a	0.04	0.16	0.00	0.01	n/a	n/a	n/a	n/a
Total PTE	0.85	3.71	1.87	8.20	17.36	76.03	0.34	1.50	0.04	0.20	0.00	0.00



#### Crude Oil Tank Detail Sheet

(15) 1100 bbl Crude Oil Tank(s) Tank Description Tank Capacity 18,500 Tank Contents Crude Oil **Emissions Controlled?** Yes Control Efficiency 95% Tank Orientation Aboveground

VOC Emission Factor	7.255	lbs/bbl
Benzene Emission Factor	0.008	lbs/bbl
n-Hexane Emission Factor	0.083	ibs/bbi
Toluene Emission Factor	0.007	lbs/bbl
Ethylbenzene Emission Factor	0.0013	lbs/bbl
Xvlene Emission Factor	0.003	lbs/bbl

Crude Oil Production per day	504	bbls
Actual Annual Crude Oil Production	184,021	bbis
PTE Annual Crude Oil Production	220,826	bbis
PTE Crude Oil Production per day	605	bbis

#### **Actual Annual Emissions Summary**

	Uncontrolled Actual E	Emissions	Controlled Actua	l Emissions
	1,335,145.89	lbs/year	66,757.29	lbs/year
VOC Emissions:	667.57	tons/year	33,38	tons/year
	152.41	lb/hr	7.82	lb/hr
	1,494.86	lbs/year	74.74	lbs/year
Benzene Emissions:	0.75	tons/year	0.04	tons/year
	0.17	lb/hr	0.01	lb/hr
n-Hexane Emissions:	15,212.40	lbs/year	760.82	lbs/year
	7.61	tons/year	0.38	tons/year
	1.74	lb/hr	0.09	lb/hr
	1,261.08	lbs/year	63.05	lbs/year
Toluene:	0.63	tons/year	0.03	tons/year
	0.14	lb/hr	0.01	lb/hr
	248.18	lbs/year	12,41	lbs/year
Ethylbenzene:	0.12	tons/year	0.01	tons/year
	0.03	lb/hr	0.00	lb/hr
	483.74	lbs/year	24.19	lbs/year
Xylene:	0.24	tons/year	0.01	tons/year
· .	0.06	lb/hr	0,00	lb/hr

## PTE Annual Emissions Summary (Flash/Working/Breathing)\*

	Uncontrolled PTE Er	nissions	Controlled PTE I	Emissions
	1,602,180.87	lbs/year	80,109,04	lbs/year
VOC Emissions:	801.09	tons/year	40.05	tons/year
	182.90	lb/hr	9.14	lb/hr
***************************************	1,793.84	lbs/year	89.69	lbs/year
Benzene Emissions:	0.90	tons/year	0.04	tons/year
	0.20	lb/hr	0.01	lb/hr
1-Hexane Emissions:	18,254.95	lbs/year	912.75	lbs/year
	9.13	tons/year	0,46	tons/year
	2.08	lb/hr	0.10	lb/hr
	1,513.30	lbs/year	75.66	lbs/year
Toluene:	0.76	tons/year	0.04	tons/year
	0.17	lb/hr	0.01	lb/hr
	297.82	lbs/year	14.89	lbs/year
Ethylbenzene:	0.15	tons/year	0.01	tons/year
***************************************	0.03	lb/hr	0.00	lb/hr
	580.48	lbs/year	29.02	lbs/year
Xylene:	0.29	tons/year	0.01	tons/year
3 mic.	0.07	lb/hr	0.00	lb/hr

<sup>\*</sup>PTE is based on a presumed 20% increase in production



### **Produced Water Tank Details**

Tank Description Tank Capacity 6) 1100 bbl Water Tank(s)

6,600 **bb**l

Tank Contents
Emissions Controlled?

Produced Water Yes

Site Specific Emissions? Control Efficiency Tank Orientation

No 95% Abóveground

VOC Emissions Factor Benzene Emissions Factor n-Hexane Emissions Factor 2.62E-01 7.00E-03 lbs/bbi

7.00E-03 lbs/bbl 2.20E-02 lbs/bbl

Water Production per day (bbls)
Actual Annual Water Production (bbls)
PTE Annual Water Production (bbls)
PTE Water Production per day (bbls)

879 211.396 253,676 698

**Actual Annual Emissions Summary** 

	Uncontrolled Ac	tual Emissions	Controlled Act	ual Emissions					
	55,385.75	lbs/year	2,769.29	lbs/year					
VOC Emissions:	27.69	tons/year	1.38	tons/year					
	6.32	lb/hr	0.32	lb/hr					
	1,479.77	lbs/year	73.99	lbs/year					
Senzene Emissions:	0.74	tons/year	0.04	tons/year					
	0.17	lb/hr	0.01	lb/hr					
n-Hexane Emissions:	4,650.71	lbs/year	232.54	lbs/year					
	2.33	tons/year	0.12	tons/year					
	0.53	lb/hr	0.03	ib/hr					

PTE Annual Emissions Summary'

	Uncontrolled PTI	EEmissions	Controlled PTE	Emissions					
	66,463.11	lbs/year	3,323.16	lbs/year					
VOC Emissions:	33.23	tons/year	1.66	tons/year					
	7.59	lb/hr	0.38	lbihr					
	1,775.73	lbs/year	88.79	bs/year					
Benzene Emissions:	0.89	tons/year	0.04	tons/year					
	0.20	lib/hr	0.01	lb/hr					
n-Hexane Emissions:	5,580,87	lbs/year	279.04	lbs/year					
	2.79	tons/year	0.14	tons/year					
	0.64	lb/hr	0.03	b/h:					

<sup>\*</sup>PTE is based on a presumed 20% increase in production



#### Crude Oil Loadout (State Emission Factors)

Source Description Crude Oil Tank Loadout Method Submerged Fill Crude Oil Tank Contents Emissions Controlled? No Control Efficiency 0%

VOC Emissions Factor 0.104 lbs/bbl Benzene Emissions Factor 1.81E-04 lbs/bb n-Hexane Emissions Factor 1.60E-03 lbs/bbi

Oil Loaded Per Day (bbis) 504 Actual Annual Oil Loadout (bbls) 184,021 PTE Annual Oil Loadout (bbls) 220,826 PTE Oil Loaded Per Day (bbls) 608

#### Actual Annual Emissions Summary

······································	Uncontrolled A	ctual Emissions	Controlled Ac	tual Emissions
	19,138,18	lbs/year	19,138.18	lbs/year
/OC Emissions:	9.57	tons/year	9,57	tons/year
	2.18	lb/hr	2.18	lb/hr
***************************************				
	33.31	ibs/year	33.31	lbs/year
Benzene Emissions:	0.02	tons/year	0.02	tons/year
	0.00	lb/hr	0:00	lb/hr
		***************************************		
***************************************	294:43	lbs/year	294.43	lbs/year
Hexane Emissions:	0.15	tons/year	0.15	tons/year
	0.03	lb/hr	0,03	liběte

### PTF Annual Emissions Summary'

	Uncontrolled P	TE Emissions	Controlled P	TE Emissions
	22,965.90	lbs/year	22,965.90	ibs/year
VOC Emissions:	11.48	tons/year	11.48	tons/year
	2.62	lb/hr	2.62	b/hr
	39.97	lbs/year	39.97	ibs/year
Benzene Emissions:	0.02	tons/year	0.02	tons/year
	0.00	lb/hr	0,00	its/hr
n-Høxane Emissions:	353.32	lbs/year	353-32	bs/year
	0.18	tons/year	0.18	tons/year
	0.04	lb/hr	0.04	b/hr

<sup>\*</sup>PTE is based on a presumed 10% increase in production



Community: Developing Engagement and Print, after 11.0.

Sign Septem Pad

87986 Elipsertelboys (metalyis)

Fugitive Component Counts & Emissions

	nubosess ron		1	·····		***************************************	7 700	Ş	888	2866	Toluene	Ethylbenzene	Xytena	o-mexone	2.3.4 Ynmethytpontons
				180.68	100.55		Unacceptiones	0.8698988	120000000000000	Companied	Uncontrolled Confulfied			Concernsioned Commission	£ (Coccostation) Contolled :
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	Promo Sado		<u> </u>	1.738.64	>38.8		<u> </u>		<b></b>	<u> </u>	4	33 0	+	4 <u>}</u>	**************************************
Gas	Others	<u> </u>	<b></b>	2.65%-04		2.23	6.90			ļ	83 - 89 - 89			<b>+</b>	<del></del>
			<u> </u>				5 88			<del> </del>	<del> </del>			1 37 1 37	+ ši + ši
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	Pione Seas		<u> </u>	1.528-03	3.106-64	*************	6.96	2.00	30	1	1 60 1 60		I 0.0 I 0.0	122	
Sugar Ox	3500		8	2.438.434	1 108-04	1000	0.60	0.88	53	81	(*   (3	92 [ 98		06   08	1 21 1 31
confirmation.	Cioceraectescs			0.7485-689	9.708.06	0.00	0.00	0.02	2.	<u> </u>	125	9.8 9.4		35	4
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	Open-ended knes	ļ	ļ	3 096 05 1806 30	1.806.05	1 250	<del> </del>			<del> </del>	1		- <del> </del>	<b>├</b> ──\$ॅं <del> </del> • ॅंडॅ	<u> </u>
	Salves .	<b></b> ,	£		1.00	<u>.</u>	<u> </u>		<u></u>	<b>*</b>	<b></b>			\$	
	Surge Sests Ottors		<b></b>	7.056.75	338.8	***********	***********			*****************	†	80 80	<del>-1</del>	1 80 1 08	1 60 1 56
Hegey 08	(0) (0) (0) (0) (0) (0) (0) (0) (0) (0)	ka	£			***************************************	1 600		88	†	1 80	08 80	1 08 1 80		1 20 1 33
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	Varience			2146-05	8 708 09		1	9.89	5	0.1	1		4		+
3	Parry Searce	<u></u>	<u> </u>	3.89.22	7,408-06	<b></b>	<del> </del>		ļ	£	ł	60 86 01 61			+
Market (S)	Otters		ļ	1,306-04	3.88.4	<del> </del>			ļ <u>8</u>	∳¥.;	ł		+ 54 - 64	†	
	Contractions Processes	<b></b>		1206.05	1,008,005 2,008,00	<u> </u>	- 88	236		ŧ##	<del>                                     </del>			1 82 1 62	
	Open ended thes		<u> </u>	772.0	3.54.6	<del></del>	<del> </del>	3 38 ···	5.5	t	0.0		***************************************	0.0 6.0	20 1 00
	FOTALS (Spg.					<del></del>	9.19	8.18	0.30	( × 86	2.39 2.99	3,03 0.00	**************************************	1 0.00	6.86 9.69
	FOTALS Swyes	•		•	<b>*</b>	***************************************	324	332	9.80	8.88	2.58 2.50	1.37 1.37	2.61 2.81	6.36 6.36	2.80 3.83

Emission Factor Science

\$270A0 400809 (450-001) Tugos Quiti

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Messy Ox		0.0000

\$66 <sup>9</sup>	Gas	1,00% (06	Process Co	States Co
Bentene	5.430.08	2.333.43		2.348-95
o Aponte	\$ 546-94	5.000.00		188.00
Majorano ana	20.308	3 1 (8 (0)		5.1836
Kalana	4.150504	1.0716.600		4.05%, 400
n-Mexicon	9 375, 475	1.808.02	ÿ	1.408.60
7.2.8 Trimethylisentane	3.300.04	3 308 408		2.336.43

#### Notes

3) The univer-exponent type was derived born compressors, approagns, abuses forms, indicates, individually individual of the proof of origin in the proof of origin in the original original individual in

3) Security continues professional from 40 CFR Part Str. Surgical VV. Falsie VV-FC and are not size operation

**Enclosed Combustor Detail Sheet-Storage Tanks** 

Source ID Number Number of combustors Combustor

Maximum Vapors Combusted Vapors combusted (based on ProMax) 0.048 MMscf/day 47.52 Mscf/day

Fuel Heating Value

2,159 BTU/scf

Potential fuel usage

17.35 MMscf/yr

Make/Model

Leed Enclosed Combustor

Total combustor input rating

4.00 MMBtur/hr

Serial Number #:

Potential Emissions

£		Hrs of			***************************************	
Pollutant	Factor	Operation		Estimated Emissions		Source of Emission
	(lb/MMBtu)	(hrs/yr)	(lb/hr)	(toy)	(lb/yr)	Factors
NOx	0.068	8,760	0.291	1.27	2547.68	AP-42 Table 13.5-1
CO	0.31	8,760	1.326	5.81	11,614,34	AP-42 Table 13.5-1



### **Enclosed Combustor Detail Sheet - Produced Gas**

Source ID Number

Flare

Maximum Vapors Combusted Vapors combusted (based on 0.36 MMscf/day

Number of combustors

\*

flare throughput)

358.90 Mscf/day

Fuel Heating Value

1,312 BTU/scf

Potential fuel usage

131.00 MMscf/yr

Combustor Max Input Rating

20.00 MMBtu/hr

Actual combustor input rating

14.00 MMBtu/hr

Make/Model:

TCI 4800

Serial Number #:

## **Potential Emissions**

	Emission	Hrs of				
Pollutant	Factor	Operation		Estimated Emissions		Source of Emission
	(ib/MMBtu)	(hrs/yr)	(lb/hr)	(tpy)	(lb/yr)	Factors
NOx	0.068	8,760	1.334	5.84	11,685.04	AP-42 Table 13.5-1
CO	0.31	8,760	6.081	26.64	53,270.04	AP-42 Table 13.5-1

#### **Actual Emissions:**

		Hrs of			•••••	
Pollutant	Factor	Operation		Estimated Emissions		Source of Emission
	(lb/MMBtu)	(hrs/yr)	(lb/hr)	(tpy)	(lb/yr)	Factors
NOx	0.068	8,760	0.926	4.87	8,114.61	AP-42 Table 13.5-1
CO	0.31	8.760	4.223	22.20	36,993.09	AP-42 Table 13.5-1

### Produced Gas Venting Details (ACTUAL)

 Source ID Number
 Produced Gas Venting
 Gas Used Hourly
 12,443,30, sc//hr

 Gas Analysis
 Site-Specific
 Gas Used Daily
 298,830,14 sc//day

 Potential operation
 8,780 hr/yr
 Gas Used Yearly
 109,00 MMsc/ryear

	Molecular	Mole (Vol.)	Gas	Weight	Venting	Venting	Venting
	Weight	Percent	Weight	Percent	Rate	Rate	Rate
Companent	(lb/lb-mole)	(%)	(lb/ib-mol)	(%)	(Mscf/day)	(ib/hr)	(tons/yr)
Nitrogen	28.013	1.30%	0.0036	1.4187%	3.8732	11,9130	52,1790
Methane	16.043	68.71%	0.1070	41.7891%	199.2162	350.9123	1,536.9958
Carbon Dioxide	44.01	1.96%	0.0086	3.3647%	5.8472	28.2544	123.7543
Hydrogen Sulfide	34.08	0.00%	5,0000	0.0000%	0.0000	0.0000	9,9000
Ethane	30.07	10.69%	0.0321	12:5482%	31.9176	105.3785	461,5577
Propane	44.097	10.86%	0,0479	18.5924%	32.4193	156.9643	687.5037
i-Sulane	58.123	1.30%	0.0076	2.9527%	3.8852	24.7940	108.5979
n-Butane	56.123	4.09%	0.0236	9,2755%	12,2050	77.8887	341.1527
Pentane	72.15	0.87%	0.0063	2.4454%	2.5921	20.5342	89,9399
n-Pentane	72.15	0.95%	0.0068	2.6707%	2.8310	22.4268	98.2293
i-Hexanes	88.177	0.35%	0.0038	1.1710%	1.0392	9.8332	43,0692
n-Hexane	86:177	0.21%	0.0018	0.6965%	0.6182	5.8490	25.6187
Senzene	78.12	0.02%	0.0001	0.0549%	0.0538	0.4611	2.0194
Cyclohexane	84.16	0.06%	0.0005	0.1939%	0.1762	1,6281	7.1311
i-Heptanes	100,204	0.33%	0.0033	1.2834%	0.9795	10,7766	47.2014
n-Heptane	100,2	0.06%	0.0006	0.2348%	0.1792	1.9712	8.6341
Toluene	92.13	0.02%	0.0002	0.0684%	0.0567	0.5740	2.5139
r-Octanes	114.231	0.16%	0.0018	0.6958%	0.4659	5.8429	26.6920
e-Octane	114.22	0.02%	0.0003	0.1026%	0.0687	0.8614	3.7728
Ethylbenzene	196.16	0.01%	0.0001	0.0207%	0.0149	0.1740	0.7623
Xylenes	106,16	0.01%	0.0001	0.0415%	0.0299	0.3481	1.5246
i-Nonanes	128.258	0.03%	0.0004	0.1703%	0.1015	1.4298	6.2827
n-Nonane	128,26	0,01%	0,0001	0,0300%	0.0179	0.2523	1.1052
i-Decanes	142.285	0.01%	0.0002	0.0778%	0.0418	0.6531	2.8608
n-Decane	142.29	0.00%	0,0000	0.0000%	0:0000	0.0000	0.0000
Undecanes	156.31	0.00%	0.0000	0.0000%	0.0000	8,0000	0.0000
Dodecanes	170.33	0.06%	0.0000	0.0000%	0.0000	0.0000	0.0000
Tridecanes	184/36	0.00%	0.0000	0.0000%	0.0000	0.0000	0.0000
Tetradecanes Pius	184,36	0.00%	0.0000	0,0000%	0.0000	0.0000	0.0000
VOC SUBTOTAL	***************************************	19,35%	0.1047	40.88%	57.7780	343.2629	1,503.4917
HAP SUBTOTAL		0,26%	0.0023	0.88%	0.7735	7.4062	32.4390
TOTAL	<u> </u>	100.00%	0.2561	100.00%	298.6301	839.7211	3,677,9785

Emissions Controlled (by flare, 98% control efficiency)

20,149,439,634,140, 40,441,63,441,4434, 1					
	Hrs of				Source of
	Operation		Vent Gas Emissions		Emission Factor
Pollutant	(hrs/yr)	(lb/hr)	(tpy)	(lb/yr)	
VOC	8,760	6.87	30.07	60,139.67	Vent Gas Emissions
HAPs	8,786	0.15	0.649	1,297.56	Vent Gas Emissions

### Produced Gas Venting Details (PTE)

Source (D Number Productif Gas Verilling Gas Used Hourly (PTE) 14,954.40 scffw
Gas Analysis Site Specific Gas Used Daily (PTE) 358.304.11 scffday
Potential operation 8,760 hr/yr Gas Used Yearly (PTE) 131.00 MM/scf/year

***************************************	Molecular	Mole (Vol.)	Gas	Weight	Venting	Venting	Venting
	Weight	Percent	Weight	Percent	Rate	Rate	Rate
omponent	(ib/ib-mole)	(%)	(lb/lb-mol)	(%)	(Macfiday)	(lb/hr)	(tons/yr)
Nitrogen	28.013	1.30%	0.0036	1.4187%	4.8550	14.3175	62:7105
Methane	16.043	66.71%	0.1070	41.7891%	239.4249	421.7386	1,847,2152
Carbon Dioxide	44,01	1,96%	0.0086	3.3647%	7.0273	33.9571	148,7322
Hydrogen Sulfide	34.08	0.00%	9.0000	0.0000%	0.0000	0.0000	0.0000
Ethane	30.07	10.69%	0.0321	12.5492%	38.3597	126.6479	554.7162
Propane	44 097	19.86%	0,8479	18,6924%	38 9828	188 6452	626.2659
i-Sutane	58,123	1:30%	0.8076	2.9527%	4.6693	29.7983	130.5168
n-Butane	58.123	4.09%	0.0238	9.2755%	14.6684	93.6094	410.0092
i-Pentane	72.15	0.87%	0.8063	2 4454%	3.1153	24.6787	108.0929
n-Pentane	72.15	0.96%	0.9068	2.6707%	3.4024	26.9633	118.0853
i-Hexanes	86.177	0.35%	0.8030	1.1710%	1.2490	11.8178	51.7621
n-Hexane	86.177	0.21%	0.0018	0.6965%	0.7429	7.0296	30.7895
Bertzenie	78.12	0.02%	0.0001	0.0549%	8.0646	8.5541	2.4270
Cyclohexane	84.18	0.06%	0.0005	0.1939%	0,2118	1,9687	8.5704
i-Heptanes	100.204	0.33%	0.0033	1,2834%	1.1772	12.9517	56.7283
n-Heptane	100.2	0.06%	0.0006	0,2348%	0.2153	2,3691	10.3767
Toluena	92.13	0.02%	8.8002	0.0684%	0.0682	0.6698	3.0213
i Octanes	114.231	0.16%	0.0018	0.6950%	0:9599	7.9222	30,7574
n-Octane	114.22	0.02%	0.0003	0.1026%	0.0825	1,0352	4.5343
Ethylbenzene	106.16	0.01%	0.0001	0.0207%	0.0179	0.2092	0.9162
Xylenes	106.16	0.01%	0.0001	0.0415%	0.0369	0.4183	1.8323
i-Nonanes	128.258	0.03%	0.0004	0.1703%	0.1220	1.7184	7.5267
n-Nonane	128.26	0.01%	0.0001	0.0300%	0.0215	0.3033	1.3283
i-Decanes	142.285	0.01%	0.0002	0.0778%	0.0502	0.7850	3.4382
n-Decane	142.29	0,00%	0.0000	0.0000%	0.0000	0.0000	0.0000
Undecanes	156.31	0.00%	0.0000	0.0000%	0.0000	0.0000	0.0000
Dodecanes	170.33	0.00%	0.0000	0.0000%	0.0000	0.0000	0.0000
Todecanes	184.36	0.00%	0.0000	0.0000%	0.0000	0.0000	0.0000
Tetradecarres Plus	184.36	0.80%	0.0003	0.0000%	0.0000	0.0000	0.0000
VOC SUBTOTAL	***************************************	19.35%	0.1047	0.4088	89,4372	412,5454	1,806.9487
HAP SUBTOTAL	•	0.26%	0.3023	0.0088	0.9296	8,9010	38,9863
TOTAL		100.90%	0.2561	1.0000	358.9041	1009.2061	4,420.3228

Emissions Controlled (by flare, 98% control efficiency)

***************************************		***************************************	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~	***************************************	é
I	Hrs of				Source of	į
	Operation		Vent Gas Emissions		Emission Factor	į
Pollutant	(hrs/yr)	(lb/hr)	(lpy)	(lb/yr)		į
VOC	8,760	8.25	36.14	72,277.96	Vent Gas Emissions	į
MAPs	8.760	0.18	0.780	1.559.45	Vent Gas Emissions	į

#### SandRidge Exploration and Production, LLC Bighorn Pad Light Oil Composition Calculations

## Site-Specific sample from the Hebron 0780 3-18H facility, collected on 6/15/2016

	Molecular Weight	Mole (Vol.) Percent	Mole	Gas Weight	Weight Percent	LHV BTU Content		
Component	(lb/lb-mol)	(%)	Frac.	(lb/lb-mol)	(%)	Btu/scf	Btu/scf*Mole Frac	
Nitrogen	28.013	0.2050%	0.00205	0.06	0.050%	0.00	0.00	
Methane	16.043	0.9130%	0.00913	0.15	0.128%	909.40	8.30	
Carbon Dioxide	44.01	0.1470%	0.00147	0.06	0.057%	0.00	0.00	
Hydrogen Sulfide	34,08	0.0000%	0.00000	0.00	0.000%	586.80	0.00	
Ethane	30.07	1.2990%	0.01299	0.39	0.343%	1,618.70	21.03	
Propane	44.097	4.4900%	0.04490	1.98	1.736%	2,314.90	103.94	
i-Butane	58.123	1.0860%	0.01086	0.63	0.554%	3,000.40	32.58	
n-Butane	58.123	5:4800%	0.05480	3.19	2.793%	3,010.80	164.99	
i-Pentane	72.15	2.5290%	0.02529	1.82	1.600%	3,699,00	93.55	
n-Pentane	72.15	3.6870%	0.03687	2.66	2.333%	3,706.90	136.67	
2,2.4- Trimethylpentane	114.231	0.0000%	0.00090	0.10	0.090%	0.00	0.00	
i-Hexanes	86.177	1 3510%	0.01351	1.16	1.021%	4.392.70	59.35	
n-Hexane	86.177	1.8460%	0.01846	1.59	1.395%	4,404.10	81.30	
Benzene	78.12	0.3370%	0.00337	0.26	0.231%	3,591.10	12.10	
Cyclohexane	84.16	0.0000%	0.00000	0.00	0.000%	4,179,90	0.00	
i-Heptanes	100.204	0.0000%	0.00000	0.00	0.000%	5,100,30	0.00	
n-Heptane	100.2	9.7050%	0.09705	9.72	8.528%	5,100.30	494.98	
Toluene	92.13	1 0920%	0.01092	1.01	0.882%	4,273,70	46.67	
i-Octanes	114.231	0:0000%	0.00000	0.00	0.000%	0.00	0.00	
n-Octane	114.22	10.0560%	0.10056	11.49	10.072%	0.00	0.00	
Ethylbenzene	106.16	0.5490%	0.00549	0.58	0.511%	4,970.70	27.29	
Xylenes	106.16	1.1300%	0.01130	1.20	1.052%	4,957,40	56.02	
i-Nonanes	128.258	0.0000%	8.00000	0.00	0.000%	6,444.09	0.00	
n-Nonane	128.26	6 2300%	0.06230	7.99	7.007%	8,444,09	401:47	
i-Decanes	142.285	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
n-Decane	142.29	47,7780%	0.47778	67.98	59.617%	0.00	0.00	
Undecanes	156.31	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
Dodecanes	170.33	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
Tridecanes	184.36	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
Tetradecanes Plus	184.36	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
Totals		100.0000%	100.0000%	114.03	100,0000%		1,740.24	

Note: Nonane heating value calculated from NOAA Cautionary Response information sheet

There is no available information for a heating value for Decanes, Octanes, Carbon Dioxide, or Nitrogen

VOC Mol % 97.44%
HAP Mol % 6.40%
Gas Specific Gravity 3.94
LHV BTU Content 1,740.24



# Gas Composition Calculations Site-Specific sample from the Hebron 0780 3-18H facility, collected on 6/15/2016

	Molecular Weight	Mole (Vol.) Percent	Mole	Gas Weight	Weight Percent	LHV BTU Content		
omponent	(lb/lb-mol)	(%)	Frac.	(lb/lb-mol)	(%)	Btu/scf	Stu/scf*Mole Frac	
Nitrogen	28.013	1.2970%	0.01297	0.36	1.419%	0.00	0.00	
Methane	16.043	66.7100%	0.66710	10.70	41.789%	909.40	606.66	
Carbon Dioxide	44.01	1.9580%	0.01968	0.86	3.365%	0.00	0.00	
Hydrogen Sulfide	34.08	0.0000%	0.00000	0.00	0.000%	586,80	0.00	
Ethane	30.07	10.6880%	0.10688	3.21	12.549%	1,618.70	173.01	
Propane	44,097	10.8560%	0.10856	4.79	18.692%	2,314.90	251.31	
i-Butane	58.123	1.3010%	0.01301	0.76	2.953%	3,000.40	39.04	
n-Butane	58.123	4.0870%	0.04087	2.38	9.276%	3,010.80	123.05	
i-Pentane	72.15	0.8680%	0.00868	0.63	2.445%	3,699.00	32.11	
n-Pentane	72.15	0.9480%	0.00948	0.68	2.671%	3,706.90	35.14	
i-Hexanes	86.177	0.3480%	0.00348	0,30	1.171%	4,392.70	15.29	
n-Hexane	86 177	0.2070%	0.00207	0.18	0.697%	4,404,10	9.12	
Benzene	78.12	0.0180%	0.00018	0.01	0.055%	3,591.10	0.65	
Cyclohexane	84.16	0.0590%	0.00059	0.05	0.194%	4,179,90	2.47	
i-Heptanes	100.204	0.3280%	0.00328	0.33	1.283%	5.100.30	16.73	
n-Heptane	100.2	0.0600%	0.00060	0.06	0.235%	5,100.30	3.06	
Toluene	92.13	0.0190%	0.00019	0.02	0.068%	4,273.70	0.81	
i-Octanes	114.231	0.1560%	0.00156	0.18	0.696%	0.00	0.00	
n-Octane	114.22	0.0230%	0.00023	0.03	0.103%	0.00	0.00	
Ethylbenzene	106.16	0.0050%	0.00005	0.01	0:021%	4,970.70	0.25	
Xvienes	106.16	0.0100%	0.00010	0.01	0.041%	4,957.40	0.50	
i-Nonanes	128.258	0.0340%	0.00034	0.04	0.170%	6,444.09	2.19	
n-Nonane	128.26	0.0060%	0.00006	0.01	0.030%	6,444,09	0.39	
i-Decanes	142.285	0.0140%	0.00014	0.02	0.078%	0,00	0.00	
n-Decane	142.29	0.0000%	0.00000	0.00	.0.000%	0.00	0.00	
Undecanes	156.31	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
Dodecanes	170.33	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
Tridecanes	184:36.	0.0000%	0.00000	0.00	0.000%	0.00	0.00	
Tetradecanes Plus	184.36	0.0000%	0.00000	0.00	0.000%	0,00	0.00	
Totals		100.0000%	100.0000%	25.61	100.0000%		1,311,75	

Note: Nonane heating value calculated from NOAA Cautionary Response Information sheet

There is no available information for a heating value for Decanes, Octanes, Carbon Dioxide, or Nitrogen

VOC Mol % 19.35%
HAP Mol % 0.61%
Gas Specific Gravity 0.88
LHV BTU Content 1,311.75



SandRidge Exploration and Production, LLC

Bighom Pad

#### Natural Gas Burner

Equipment ID Separator Heater(s)

Source Description (2) 2 MMBtu/hr Separator Heater(s)

Equipment Usage

 Equipment Make
 Potential operation
 8.760 hr/yr

 Equipment Model
 Potential fuel usage
 26.71 MMsc/lyr

 Serial Number
 N/A
 3.049.4 sc//nr

escretizations: 140

Fuel Type Field Gas

Net Fuel Heating Value 1:312 Btu/scf

Fuel Heating Value-Avg 1,312 Btu/scf Fuel Heating Value-Prod 1,312 Btu/scf Heat Input 4.00 MMBtu/hr Exit Temperature 700 deg F

Permit Status

Burner Efficiency 80 %

#### Potential Emissions

Pollutant	Emission	Nominal	Hrs of		d Emissions	Source of	
	Factor Rating		Operation			Emission	
	(lb/MMscf)	(MMBtu/hr)	(hrs/yr)	(lb/hr)	(tpy)	Factor	
NOx	100.00	4.00	8,760	0.38	1.67	AP-42.	***************
co	84,00	4.00	8,760	0.32	1.40	AP-42	
TOC	11.00	4.00	8,760	0.04	0.18	A8-42	
voc	5.50	4.00	8,760	0.02	0.09	AP-42	
SO <sub>2</sub>	0.00	4.00	8,760	0.00	0.00	NA - No HZS	
PM/PM <sub>10</sub> /PM <sub>2.5</sub>	7.60	4.00	8,760	0.03	0.13	Á9-42	

Natural gas burner emissions can be estimated using the following equation:

$$E_{3} = \frac{EF_{3} \times BR \times 10^{-6} \times HO}{\frac{B_{EF}}{100} \times HV_{Arg} \times 10^{-6} \times 2000} \times \frac{HV_{Prod}}{HV_{Arg}} \times \left(\frac{\left(100 - DRE\right)}{100}\right)$$

where:

 $E_X$  = emissions for pollutant X (tpy);

EF<sub>2</sub> = emission factor for pollutant X (lb/MMscf);

BR = burner rating (MMBtu/hr);

Biss - burner efficiency (%)x

HO = unmuch hours of operation (ht/yr);

 $HV_{\rm Avg}$  -- average gas heating value (Btu/scf);

HV<sub>red</sub> = produced gas heating value (Bhi/scf);

DRE - destruction and removal efficiency (%):

1-ton = 2000-lb:

1-MMBtu = 10°-Btu, and

I-MMsef = 10°-sef.

3

# ATTACHMENT D AMBIENT AIR QUALITY ANALYSIS

# SandRidge Exploration and Production, LLC – Bighorn Pad Ambient Air Quality Analysis

Air dispersion modeling for the Bighorn Pad is unnecessary because the facility emissions are less than the modeling thresholds found under Table 1 of the Colorado Modeling Guideline issued May 20, 2011. This table shows the emissions at the facility with the installation of 15 crude oil storage tanks, six produced water storage tanks, two crude oil truck loadout points, one produced water truck loadout, two heater-treaters, fugitive emissions, one Leed combustor, produced gas flaring, and a natural gas compressor engine associated with what is currently a temporary facility, but will be associated with the Bighorn facility upon teardown of the individual temporary facility. As you can see, the anticipated emissions for each criteria pollutant is below the modeling threshold.

Pollutant	Modeling Threshold (tons per year or TPY)	Bighorn Emissions (TPY)		
NO <sub>x</sub>	40	9.77		
CO	100	35.80		
PM <sub>10</sub> /PM <sub>2.5</sub>	15/5	0.20/0.20		
SO <sub>x</sub>	40	0.00		



# ATTACHMENT E SITE SPECIFIC OIL AND GAS ANALYSES



Number: 2500-16060005-003A

Windsor Laboratory 208 Main Street - Unit A Windsor, CO 80550

Amanda Graves Sandridge 123 Robert Skerr Ave. Oklahoma City, OK 73102

Station Name: Hebron Station Number: 0780 3-18H Sample Point: Flowback Seperator

H2S 0 ppm

Cylinder No: 1030-03047

Analyzed:

06/17/2016 11:08:42 by AH

June 20, 2016

Sampled By: Sample Of:

Bob Burns

Gas Sample Date: 06/15/2016

Sample Conditions: 58 psig, @ 98 °F Method: GPA 2286

## **Analytical Data**

Components	Mol. %	Wt. %	GPN 14.696 p			
Nitrogen	1.297	1.421	toods to an alternation of the second	GPM TOTAL C2+	8.248	unnnuurnenuur.
Carbon Dioxide	1.958	3.370		GPM TOTAL C3+	5.381	
Methane	66.710	41.846		GPM TOTAL iC5+	0.663	
Ethane	10.688	12.567	2.	7		
Propane	10.856	18.718	2.9	9		
Iso-butane	1.301	2.957	0.4	7		
n-Butane	4.087	9.289	1.3	2		
Iso-pentane	0.868	2.449	0.:	8		
n-Pentane	0.948	2.675	0.:	5		
Hexanes Plus	1.287	4.708		L		
	100.000	100.000	8.3	8		
Calculated Physica	l Properties	0.00.00000	Total	C6+		
Relative Density Rea			0.8871	3.2001		
Calculated Molecula	r Weight		25.57	92.68		
Compressibility Fact	or		0.9946			
GPA 2172-09 Calcu	lation:					
<b>Calculated Gross B</b>	TU per ft <sup>3</sup> @	14.696 ps	ia & 60°F			
Real Gas Dry BTU	-		1457	5008		
Water Sat. Gas Base BTU			1431	4920		

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



Number: 2500-16060005-003A

Windsor Laboratory 208 Main Street - Unit A Windsor, CO 80550

Amanda Graves Sandridge 123 Robert Skerr Ave. Oklahoma City, OK 73102

Station Name: Hebron Station Number: 0780 3-18H

Sample Point: Flowback Seperator

Cylinder No: 1030-03047

Analyzed: 06/17/2016 11:08:42 by AH

H2S 0 ppm

June 20, 2016

Sampled By:

Bob Burns

Sample Of: Sample Date:

Spot Gas

06/15/2016

Sample Conditions: 58 psig, @ 98 °F Method: GPA 2286

# **Analytical Data**

Components	Mol. %	Wt. %	GP 14.696	M at psia			
Nitrogen	1.297	1.421			GPM TOTAL C2+	8.470	
Carbon Dioxide	1.958	3.370			GPM TOTAL C3+	5.603	
Methane	66.710	41.846			GPM TOTAL iC5+	0.885	
Ethane	10.688	12.567	:	2.867			
Propane	10.856	18.718	:	2.999			
Iso-Butane	1.301	2.957	(	0.427			
n-Butane	4.087	9.289		1.292			
Iso-Pentane	0.868	2.449	(	0.318			
n-Pentane	0.948	2.675	(	0.345			
Hexanes	0.555	1.823	(	0.222			
Heptanes Plus	0.732	2.885		NIL			
	100.000	100.000		8.470			
Calculated Physica	l Properties		Total		C7+	Sichundulidanun manapanan papapapan kanisida di	
Relative Density Rea	al Gas		0.8871		3.4038		
Calculated Molecula	r Weight		25.57		98.58		
Compressibility Fact	or		0.9946				
GPA 2172-09 Calcu	lation:						
<b>Calculated Gross E</b>	TU per ft <sup>3</sup> @	14.696 ps	ia & 60°F				
Real Gas Dry BTU			1457		5263		
Water Sat. Gas Base	e BTU		1431		5171		

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



Number: 2500-16060005-003A

Windsor Laboratory 208 Main Street – Unit A Windsor, CO 80550

Amanda Graves Sandridge 123 Robert Skerr Ave. Oklahoma City, OK 73102 June 20, 2016

Station Name: Hebron Station Number: 0780 3-18H Sample Point: Flowback Seperator

Cylinder No: 1030-03047

**Calculated Physical Properties** 

Analyzed: 06/17/2016 11:08:42 by AH

Sampled By: Bob Burns
Sample Of: Gas Spot
Sample Date: 06/15/2016
Sample Conditions: 58 psig, @ 98 °F
Method: GPA 2286

# **Analytical Data**

Components	Mol. %	Wt. %	GPM at 14.696 psia	
Nitrogen	1.297	1.421		
Carbon Dioxide	1.958	3.370		
Methane	66.710	41.846		
Ethane	10.688	12.567	2.867	
Propane	10.856	18.718	2.999	
Iso-Butane	1.301	2.957	0.427	
n-Butane	4.087	9.289	1.292	
Iso-Pentane	0.868	2.449	0.318	
n-Pentane	0.948	2.675	0.345	
i-Hexanes	0.348	1.131	0.137	
n-Hexane	0.207	0.692	0.085	
Benzene	0.018	0.056	0.005	
Cyclohexane	0.059	0.194	0.020	
i-Heptanes	0.328	1.165	0.129	
n-Heptane	0.060	0.237	0.028	
Toluene	0.019	0.067	0.006	
i-Octanes	0.156	0.650	0.070	
n-Octane	0.023	0.101	0.012	
Ethylbenzene	0.005	0.019	0.002	
Xylenes	0.010	0.037	0.004	
i-Nonanes	0.034	0.193	0.018	
n-Nonane	0.006	0.031	0.003	
Decane Plus	0.014	0.135	NIL	
	100.000	100.000	8.767	

C10+

Calculated Molecular Weight	25.57	139.08
GPA 2172-09 Calculation:		
Calculated Gross BTU per ft3 @ 14.6	96 psia & 60°F	
Real Gas Dry BTU	1456.8	7264.1
Water Sat. Gas Base BTU	1431.4	7137.4
Relative Density Real Gas	0.8871	4.8036
Compressibility Factor	0.9946	
Comments: H2S 0 ppm		

Total

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



Number: 2500-16060005-007A

Windsor Laboratory 208 Main Street - Unit A Windsor, CO 80550

Amanda Graves Sandridge 123 Robert Skerr Ave. Oklahoma City, OK 73102 June 20, 2016

Station Name: Hebron Station Number: 0780 3-18H

Sample Point: Flowback Seperator

Cylinder No: 35118

Analyzed: 06/20/2016 12:16:16 by AH Sampled By: Bob Burns Sample Of: Liquid Sample Date:

Spot 06/15/2016

Sample Conditions: 125 psig, @ 130 °F

Method: GPA 2186

## **Analytical Data**

		******************************			
Components	<b>M</b> ol. %	Wt. %	L.V. %		
Nitrogen	0.560	0.167	0.147		
Carbon Dioxide	0.091	0.043	0.037		
Methane	0.956	0.163	0.385		
Ethane	1.630	0.522	1.038		
Propane	7.271	3.416	4.770		
Iso-Butane	2.015	1.248	1.570		
n-Butane	9.904	6.133	7.436		
Iso-Pentane	4.792	3.683	4.173		
n-Pentane	6.694	5.145	5.778		
Hexanes Plus	66.087	79.480	74.666		
	100.000	100.000	100.000		
Calculated Physica	al Properties	·	Total	C6+	
Specific Gravity at 6	60°F		0.7083	0.7540	
API Gravity at 60°F			68.2779	56.1782	
Molecular Weight			93.865	112.888	
Pounds per Gallon (			5.905	6.286	
Pounds per Gallon (			5.899	6.279	
Cu. Ft. Vapor per G		96 psia	23.873	21.130	
Specific Gravity as a			3.241	3.898	
Calculated Vapor Pr	ressure @ 10	00°F	103.00	28.24	
BTU / GAL.			120646	127365	
BTU / LB.			20381	20200	
Comments: H2S	) ppm				

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



Number: 2500-16060005-007A

Windsor Laboratory 208 Main Street - Unit A Windsor, CO 80550

Amanda Graves Sandridge 123 Robert Skerr Ave. Oklahoma City, OK 73102

Station Name: Hebron

Station Number: 0780 3-18H Sample Point: Flowback Seperator

Cylinder No:

35118

Analyzed:

06/20/2016 12:16:16 by AH

Sampled By:

Bob Burns

Sample Of:

Liquid

Sample Date:

Spot 06/15/2016

June 20, 2016

Sample Conditions: 125 psig, @ 130 °F

Method:

GPA 2186

# **Analytical Data**

Components	Mol. %	Wt. %	L.V. %		
Nitrogen	0.560	0.167	0.147		***************************************
Carbon Dioxide	0.091	0.043	0.037		
Methane	0.956	0.163	0.385		
Ethane	1.630	0.522	1.038		
Propane	7.271	3.416	4.770		
Iso-Butane	2.015	1.248	1.570		
n-Butane	9.904	6.133	7.436		
Iso-Pentane	4.792	3.683	4.173		
n-Pentane	6.694	5.145	5.778		
Hexanes	8.488	7.699	8.168		
Heptanes Plus	57.599	71.781	66.498		
	100.000	100.000	100.000		
Calculated Physica	al Properties		Total	C7+	
Specific Gravity at 6			0.7083	0.7645	
API Gravity at 60°F			68.2779	53.5793	
Molecular Weight			93.865	116.980	
Pounds per Gallon (in Vacuum)		5.905	6.374		
Pounds per Gallon (	Pounds per Gallon (in Air)			6.367	
	Cu. Ft. Vapor per Gallon @ 14.696 psia		23.873	20.677	
BTU / GAL.	_	•	120646	128729	
BTU / LB.			20381	20120	
Comments: H2S (	) ppm				

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



Number: 2500-16060005-007A

Windsor Laboratory 208 Main Street - Unit A Windsor, CO 80550

Amanda Graves Sandridge 123 Robert Skerr Ave. Oklahoma City, OK 73102

Station Name: Hebron Station Number: 0780 3-18H

Sample Point: Flowback Seperator Cylinder No:

Analyzed:

06/20/2016 12:16:16 by AH

Sampled By: Sample Of:

Bob Burns Spot

June 20, 2016

Liquid 06/15/2016

Sample Date: Sample Conditions: 125 psig, @ 130 °F

GPA 2186 Method:

## **Analytical Data**

Components	Mol. %	Wt. %	L.V. %
Nitrogen	0.560	0.167	0.147
Methane	0.956	0.163	0.385
Carbon Dioxide	0.091	0.043	0.037
Ethane	1.630	0.522	1.038
Propane	7.271	3.416	4.770
Iso-Butane	2.015	1.248	1.570
n-Butane	9.904	6.133	7.436
Iso-Pentane	4.792	3.683	4.173
n-Pentane	6.694	5.145	5.778
i-Hexanes	4.780	4.295	4.534
n-Hexane	3.708	3.404	3.634
Benzene	0.445	0.370	0.296
Cyclohexane	1.759	1.577	1.427
i-Heptanes	10.027	10.010	9.664
n-Heptane	2.802	2.991	3.078
Toluene	1.216	1.194	0.971
i-Octanes	10.961	12.581	11.850
n-Octane	2.517	3.063	3.070
Ethylbenzene	0.729	0.824	0.671
Xylenes	1.467	1.659	1.342
i-Nonanes	7.166	9.507	8.699
n-Nonane	1.673	2.285	2.238
i-Decanes	10.248	14.559	12.613
Decanes Plus	6.589	11.161	10.579
	100.000	100.000	100.000

Calculated Physical Properties	Total	C10+
API Gravity at 60°F	68.2779	48.6350
Pounds per Gallon (in Air)	5.899	6.542
Pounds per Gallon (in Vacuum)	5.905	6.549
Cu. Ft. Vapor per Gallon @ 14.696 psia	23.873	17.332
Specific Gravity at 60°F	0.7083	0.7855
Molecular Weight	93.865	143.387
BTU / GAL.	120646	132220
BTU / LB.	20381	19977

Comments: H2S 0 ppm

Hydrocarbon Laboratory Manager

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality Quality Assurance:

assurance, unless otherwise stated.



Number: 1030-16060714-003A

**Houston Laboratories** 8820 Interchange Drive Houston, TX 77054 Phone 713-660-0901

June 28, 2016

**Bobby Powers** Sandridge Midstream 123 Roberts Kern Ave Oklahoma, TX 73102

Station Name: Hebron Station Number: 07803-18H Station Location: Coalmont, CO Sample Point: Hebron 07803-18H Sampled By: Sample Of:

Liquid

Spot

Sample Date:

06/15/2016

Sample Conditions: 120 psig, @ 130 °F

## **Analytical Data**

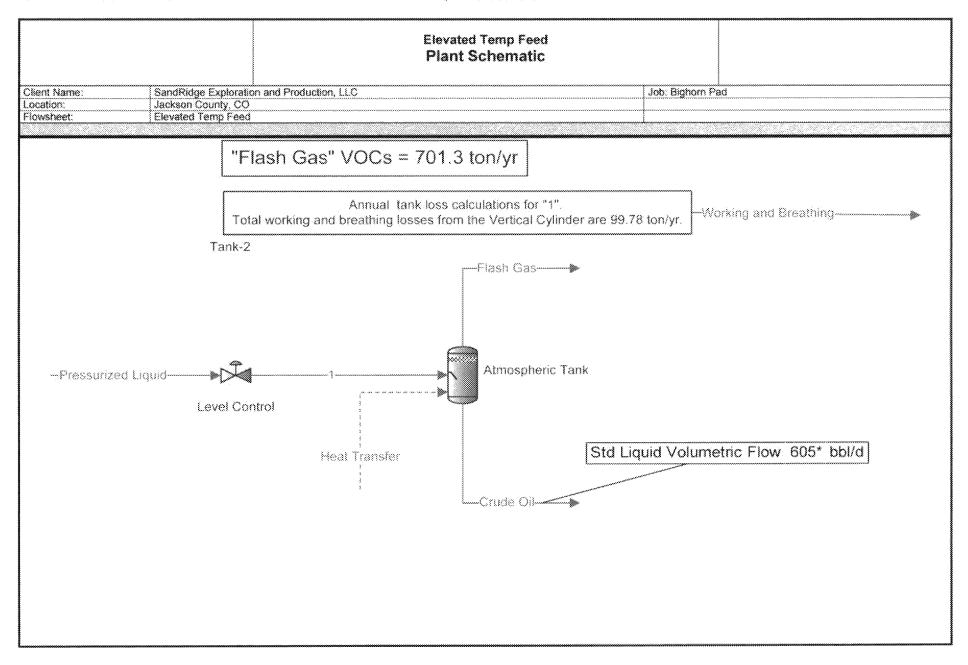
Test	Method	Result	Units	Detection Lab Limit Tech.	Analysis Date
Reid Vapor Pressure (RVP) @ 100° F	ASTM D-323	5.75	psi	JH	06/28/2016
API Gravity @ 60° F	ASTM D-4052	35.20	. 0	JH	06/28/2016
Specific Gravity @ 60/60° F	ASTM D-4052	0.8488	_	JH	06/28/2016
Density @ 60° F	ASTM D-4052	0.8480	g/ml	JH	06/28/2016

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

# ATTACHMENT F BRE PROMAX FLASH, WORKING AND BREATHING RESULTS



<sup>\*</sup> User Specified Values ? Extrapolated or Approximate Values

# **Process Streams Report** All Streams

Tabulated by Total Phase

SandRidge Exploration and Production, LLC Jackson County, CO Elevated Temp Feed Job: Bighom Pad Client Name: Location: Flowsheet:

Stream Composition								
Mole Fraction	Crude Oil	Flash Gas %	Pressurized Liquid %	Working and Breathing %				
Nitrogen	0.00940862	7,67451	0.56	0 *	<b></b>			
Methane	0.0599488	12.5344	0.956 *	0 *				
Carbon Dioxide	0.0156922	1.0641	0.091 ^	0 *				
Ethane	0.545451	15.6441	1.63 *	0 *				
Propane	5,13615	34:8567	7.271 *	48.3254 *				
i-Butane	1.81677	4.57647	2.015 *	7.33244 *				
n-Butane	9.46599	15.5637	9.904 *	27.8302 *				
i-Pentane	4.94004	2.87906	4,792 *	5.88396 *				
n-Pentane	6.98162	2.97754	6,594 *	6.22744 *				
2-Methylpentane	5.08584	0.815084	4.78 *	1.87347 *				
n-Hexane	3.96297	0.413362	3.708	1.03841 *				
Benzene	0.475727	0.0479627	0.445	0.0763994				
Cyclohexane	1.88349	0.150429	1.759	0.314679 *				
Isoheptane	10.7644	0.498665	10.027	0.333581 *				
n-Heptane	3.01186	0.090323	2.802	0.227199				
Toluene	1.30749	0.0337856	1,216	0.0605713 *				
2.2.4-Trimethylpentane	Ō	0	0 '	0 ×				
n-Octane	14.5117	0.121126	13.478	0.320674				
Ethylbenzene	0.784982	0.00561976	0.729 '	0.0120784				
p-Xylene	1.57967	0.0111098	1.467					
Isononane	7.71856	0.0260227	7.166	0.0743517				
Nonane	1.80217	0.00393082	1,673					
2-Methylnonane	11,0404	0.00853183	10.248	0.0292984				
C10+	7.09866	0.00343363	6,589	0,00647471 *				

	Crude Oil	Flash Gas	Pressurized Liquid	Working and Breathing	
Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	
Nitrogen	0.00583567	0.368383	0.374219 *	0 *	
Methane	0.0371831	0,601662	0.638845 *	0 *	
Carbon Dioxide	0.00973302	0.0510776	0.0608106 *	0 *	
Ethane	0.338314	0.75093	1.08924 *	0 *	
Propane	3.18568	1.67315	4.85883 *	0.20199 *	
i-Butane	1.12685	0.219675	1.34652 *	0.030648 *	
n-Butane	5.87126	0.747073	6,61833 *	0.116324 *	
i-Pentane	3.06405	0.138197	3.20225 *	0.0245937 *	
n-Pentane	4.33033	0.142924	4.47325 *	0.0260293 *	
2-Methylpentane	3.1551	0.0391248	3.19423 *	0.00783068 *	
n-Hexane	2.45802	0.0198417	2.47786 *	0.00434032 *	
Benzene	0.295068	0.00230225	0.29737 *	0.000319333 *	
Cyclohexane	1.16823	0.00722074	1.17545 *	0.00131529 *	
Isoheptane	6,67659	0.0239363	6.70052 *	0.0013943 *	
n-Heptane	1.8681	0.00433558	1.87243 *	0.000949643 *	
Toluene	0.810968	0.00162174	0.81259 *	0.000253175 *	
2,2,4-Trimethylpentane	0	0	0 ,	0 *	
n-Octane	9.00083	0.00581417	9 00665 *	0.00134035 *	
Ethylbenzene	0,486883	0.000269753	0.487153 *	5.0485E-05 *	
p-Xylene	0.979787	0.00053328	0.98032 *	9.08938E-05 *	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Îsononane	4.78742	0.00124911	4.78867 *	0.000310774 *	
Nonane	1,11779	0.000188683	1.11798 *	4.86814E-05 *	
2-Methylnonane	6.8478	0.000409535	6.84821 *	0.000122461 *	
C10+	4.40292	0.000164817	4.40309 *	2.70629E-05 *	

<sup>\*</sup> User Specified Values
? Extrapolated or Approximate Values

Client Name:

# **Process Streams Report All Streams Tabulated by Total Phase** SandRidge Exploration and Production, LLC Job: Bighom Pad

Location:	Jackson County, CO
Flowsheet:	Elevated Temp Feed

Mass Fraction	Crude Oil %	Flash Gas %	Pressurized Liquid %	Working and Breathing %	
Nirogen	0.00264743	5.03602	0.164316 *	0 *	
Wethane	0.00966015	4.71028	0.180641	Ö *	
Carbon Dioxide	0.00693683	1.09698	0.0419483 *	0 *	,
Ethane	0.164743	11.019	0.513374 ^	······································	
Propane	2.27491	36.0041	3.35828	39.0999	***************************************
i-Butane	1.06065	6.23079	1.22672 ×	7.81978 *	
n-Bulane	5.52637	21,1898	6.02947 *	29.6799	
-Pentane	3.58007	4.86576	3.62137	7.78938	***************************************
n-Pentane	5.05961	5.03219	5.05873 *	8.24408 *	
2-Methylpentane	4.40315	1.64534	4.31457	2.96233 *	
n-Hexane	3.43033	0.834419	3.34695 *	1.64193 *	***************************************
Benzene	0.373256	0.0877589	0.364086 *	0.109499 *	
Öydohexane	1.5922	0.296556	1,55058	0.485931	
Soheptane	10.8342	1.17046	10.5238	0.613313 *	
n-Heplane	3.03139	0.212005	2.94084	0.417721 *	
Toluene	1 21007	0.0729193	1.17355	0.102403	
2,2,4-Trimethylpentane	0	0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0 *	
n-Odane	16.6504	0.324104	16.126	0.672113	
Ethylberizene	0.837092	0.0139756	0.810654	0.0235285	
p-Xylene	1.68454	0.0276285	1.63132	0.042361 *	
Isononane	9.94359	0.0781803	9.62672	0.174973	
		*****		rite con concentrativa con incidenta con contrativa con contrativa con contrativa con contrativa con contrativ	******************************
	2 32168	0.0118094	2 24749 *	3 33 (32/7233)28 / ^3	
Nonane	2.32168 15.7786	0.0118094 0.0284356	2.24749 °	0.0274087	
	2.32168 15.7785 10.2239	0.0118094 0.0284356 0.0115328	2.24749 15.2727 1 9.89592 1	0.0274087 0.0764887 ° 0.0170347 °	
Nonane 2-Methylnonane	15.7785	0.0284356	15.2727	0,0764887 *	
Nonane 2-Methylnonane	15.7785	0.0284356	15.2727 * 9.89592 * Pressurized	0.0764887 * 0.0170347 * Working and	
Nonane 2 Methylnonane C10+	15.7785 10.2239 Crude Oil	0.0284356 0.0115328 Flash Gas	15.2727 9.89592 2 Pressurized Liquid	0.0764887 * 0.0170347 * Working and Breathing	
Nonane 2 Methylnonane C10+ Mass Flow	15.7785 10.2239 Crude Oil Ib/h	0.0284356 0.0115328 Flash Gas	15.2727 9.89592 Pressurized Liquid Ib/h	0.0764887 * 0.0170347 * Working and Breathing ib/h	
Nonane 2 Methylnonane C10+ Mass Flow Nitrogen	15.7785 10.2239 Crude Oil Ib/h 0.163477	0.0284356 0.0115328 Flash Gas lb/h 10.3197	15.2727 9.89582 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	0.0764887 * 0.0170347 * Working and Breathing lb/h 0 *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane	15.7785 10.2239 Crude Oil Ib/h 0.163477 0.596509	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214	15.2727 9.89582 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	0.0764887 * 0.0170347 * Working and Breathing ib/h 0 * 0 *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide	15.7785 10.2239 Crude Oil Ib/h 0.163477 0.596509 0.428346	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214 2.2479	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 10.2486 2.67624	0.0764887 * 0.0170347 * Working and Breathing ib/h 0 * 0 * 0 * 0 *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane	15.7785 10.2239 Crude Oil Ib/h 0.163477 0.596509	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214	15.2727 9.89582 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	0.0764887 * 0.0170347 * Working and Breathing ib/h 0 * 0 *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide	15.7785 10.2239 Crude Oil ib/h 0.163477 0.596509 0.428346 10.1728	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214 2.2479 22.5797	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 10.2486 2.67624 32.7525	0.0764887 * 0.0170347 * * * * * * * * * * * * * * * * * * *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane	15.7785 10.2239 Crude Oil Ib/h 0.163477 0.596509 0.428346 10.1728 140.475 65.4947	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214 2.2479 22.5797 73.7787	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 10.2486 2.67624 32.7525 214.253	0.0764887 * 0.0170347 * * * * * * * * * * * * * * * * * * *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane i-Butane	15.7785 10.2239 Crude Oil ib/h 0.163477 0.596509 0.428346 10.1728 140.475	0.0284356 0.0115328 Flash Gas Ib/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215	15.2727 9 89592 Pressurized Liquid ib/h 10.4831 10.2486 2.67624 32.7525 214.253 78.2627	0.0764887 * 0.0170347 *   Working and Breathing ib/h	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane I-Butane n-Butane	15.7785 10.2239 Crude Oil Ib/h 0.163477 0.596509 0.428346 10.1728 140.476 65.4947 341.25 221.067	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768	15.2727 9 89582 Pressurized Liquid bb/h 10.4831 10.2486 2.67624 32.7626 214.253 78.2627 384.672 231.038	0.0764887 * 0.0170347 *   Working and Breathing ib/h	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane I-Butane n-Butane I-Pentane I-Pentane n-Pentane	15.7785 10.2239 Crude Oil Ib/h 0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25	0.0284356 0 0115328 Flash Gas Ib/h 10 3197 9.65214 2 2479 22 5797 73 7787 12 768 43 4215 9.97077	15.2727 9.89582 Pressurized Liquid bb/h 10.4831 9.267624 9.277625 9.42627 9.84672 9.84672 9.89582 9.42627 9.84672 9.84672 9.8627	0.0764887 * 0.0170347 * * * * * * * * * * * * * * * * * * *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane I-Butane n-Butane P-Pentane	15.7785 10.2239 Crude Oil  Ib/h  0.163477 0.596509 0.428346 10.1728 140.476 65.4947 341.25 221.067 312.428 271.892	0.0284356 0.0115328 Flash Gas bh/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215 9.97077 10.3118	15.2727 9 89582 9 89582 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.017047 *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane i-Butane n-Butane n-Pentane n-Pentane 2-Methylpentane	15.7785 10.2239 Crude Oil  ib/h 0.163477 0.596509 0.428346 10.1728 140.476 65.4947 341.25 221.067 312.428	0.0284356 0 0115328 Flash Gas bh/h 10 3197 9.65214 2 2479 22 5797 73 7787 12 768 43 4215 9.97077 10 3118 3.37159	15.2727 9 89582 9 89582 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.017044 * 0.01704812 * 0.0170347 * 0.01704812 * 0.0170347 * 0.0170347 * 0.01704812 * 0.0170347 * 0.01	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane I-ButaneButane I-Pentane I-Pentane 2-Methylpentane I-Hexane	15.7785 10.2239 Crude Oil  Ib/h  0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 3312.428 271.892 211.821 23.0483	0.0284356 0.0115328 Plash Gas bh/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215 9.97077 10.3118 3.37159 1.70987	15.2727 9.89582 9.80582 9.8058	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.017044 * 0.017048 * 0	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane i-Butane n-Butane n-Pentane n-Pentane 2-Methylpentane n-Hexane	15.7785 10.2239 Crude Oil  Ib/h  0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 312.428 271.892 211.821	0.0284356 0.0115328 Plash Gas bb/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215 9.97077 10.3118 3.37159 1.70987 0.179833	15.2727 9.89592 9.89592 10.4831 10.4831 10.2486 2.67624 32.7625 214.253 78.2627 384.672 231.038 322.74 275.264 213.531 23.2282	0.0764887 * 0.0170347 * 0.0170	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane i-Butane n-Butane n-Pentane 2-Methylpentane n-Hexane Benzene Cyclohexane Isoheptane	15.7785 10.2239 Crude Oil  ib/h  0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 312.428 271.892 211.821 23.0483 98.3174 669.007	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215 9.97077 10.3118 3.37159 1.70987 0.179833 0.607693	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 9.267624 9.32.7625 9.32.7625 9.32.7625 9.32.7625 9.32.7625 9.32.7625 9.32.892 98.9251	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.017044 * 0.017044 * 0.017049 * 0.0249437 * 0.110694 * 0.017049 * 0.0170694 * 0.017049 * 0.0170694 * 0.017049 * 0.0170694 * 0	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane i-Butane n-Butane n-Pentane n-Pentane n-Pentane n-Pentane n-Hexane Benzene Cyclohexane	15.7785 10.2239 Crude Oil ib/h 0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 312.428 271.892 211.821 23.0483 98.3174	0.0284356 0.0115328 Flash Gas lb/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215 9.97077 10.3118 3.37159 1.70987 0.179833 0.607693 2.39847	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 10.2486 2.67624 32.7625 214.253 78.2627 384.672 231.038 322.74 275.264 213.531 23.2282 98.9251 671.406	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.017044 * 0.0170494 * 0.0139711 * 0.095156 * 0.017044 * 0.0139711 * 0.095156 * 0.0170487 * 0.0170494 * 0.0139711 * 0.095156 * 0.0170487 * 0.0170494 * 0.0139711 * 0.095156 * 0.0170487 * 0.0170494 *	
Nonane 2-Methylnonane C10+  Mass Flow  Mitrogen Methane Carbon Dioxide Ethane Propane i-Butane n-Butane Pentane 2-Methylpentane n-Pensane Bersane Cyclonexane Isoheptane Isoheptane n-Heptane Toluene	15.7785 10.2239 Crude Oil  ib/h 0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 312.428 271.892 211.821 23.0483 98.3174 669.007 187.187	0.0284356 0.0115328 Flash Gas Ib/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215 9.97077 10.3118 3.37159 1.70987 0.179833 0.607693 2.39847 0.434434	15.2727 9.89592 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502 2 9.89502	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.017048 * 0.0139711 * 0.095156 * 0.0170347 * 0.017034	
Nonane 2-Methylnonane C10+  Mass Flow Mitrogen Methane Carbon Dioxide Ethane Propane i-Butane n-Butane 1-Pentane 2-Methylpentane n-Hexane Berxane Cyclonexane Isoheptane n-Heptane	15.7785 10.2239 Crude Oil  ib/h 0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 312.428 271.892 211.821 23.0483 98.3174 669.007 187.187 74.7213	0.0284356 0.0115328 Flash Gas Ib/h 10.3197 9.65214 2.2479 22.5797 73.7787 12.768 43.4215 9.97077 10.3118 3.37159 1.70987 0.179833 0.607693 2.39847 0.434434	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 9.27624 9.27625 214.253 78.2627 9.384.672 9.375.264 213.531 23.282 9.89251 671.406 187.621 74.8707	0.0764887 * 0.0170347 * * * * * * * * * * * * * * * * * * *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane I-Butane n-Butane I-Pentane I-Pentane 2-Methylpentane n-Hexane Benzene Cyclohexane Isoheptane n-Heptane n-Heptane Toluene 2-2-4-Trimethylpentane n-Octane	15.7785 10.2239  Crude Oil  Ib/h 0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 312.428 271.892 211.821 23.0483 98.3174 669.007 187.187 74.7213 0	0.0284356 0 0115328 Flash Gas Ib/h 10 3197 9.65214 2 2479 22 5797 73 7787 12 768 43 4215 9.97077 10 3118 3.37159 1.70987 0.179833 0.607693 2.39847 0.434434 0.149424 0.0564144	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 10.2486 2.67624 32.7525 214.253 78.2627 384.672 231.038 322.74 275.264 213.531 23.2282 98.9251 671.406 187.621 74.8707 0 1028.82	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0136711 * 0.095156 * 0.0233271 * 0.0170347 * 0.0170347 * 0.0233271 * 0.0170347 * 0.0233271 * 0.0170347 * 0.0233271 * 0.0233271 * 0.024937 * 0.0249437 * 0.0136711 * 0.095156 * 0.0233271 * 0.0233271 * 0.0233271 * 0.024947 * 0.0233271 * 0.0233271 * 0.0233271 * 0.0233271 * 0.024947 * 0.0233271 * 0.0233271 * 0.0233271 * 0.0233271 * 0.0233271 * 0.024947 * 0.0233271 *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane I-Butane I-Butane I-Pentane I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-	15.7785 10.2239  Crude Oil  Ib/h 0.163477 0.596509 0.428346 10.1728 140.475 65.4947 341.25 221.067 312.428 271.892 211.821 23.9483 98.3174 669.907 187.187 74.7213 0 1028.15 51.69	0.0284356 0 0115328 Plash Gas b/h 10 3197 9.65214 2 2479 22 5797 73 7787 12 768 43 4215 9.97077 10 3118 3 37159 1 70987 0 179833 0 607693 2 39847 0 434434 0 149424 0 0.664144 0 0286383	15.2727 9.89592 Pressurized Liquid ib/h 10.4831 9.27624 9.27625 214.253 78.2627 9.384.672 9.375.264 213.531 23.282 9.89251 671.406 187.621 74.8707	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170494 * 0.0139711 * 0.095156 * 0.0233571 * 0.00535974 * 0.0170347 * 0.0153106 * 0.00535974 * 0.0170347 * 0.0153106 * 0.00535974 * 0.0170347 * 0.0153106 * 0.00535974 * 0.0170347 * 0.0153106 * 0.00535974 *	
Nonane 2-Methylnonane C10+  Mass Flow Nitrogen Methane Carbon Dioxide Ethane Propane I-Butane I-Butane I-Pentane I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-	15.7785 10.2239  Crude Oil  Ib/h 0.163477 0.596509 0.428346 10.1728 140.476 65.4947 341.25 221.967 312.428 271.892 211.821 23.0483 98.3174 669.007 187.187 74.7213 0 1028.15 51.69	0.0284356 0 0115328 Plash Gas bhh 10 3197 9.65214 2 2479 22 5797 73 7787 12 768 43 4215 9.97077 10 3118 3.37159 1.70987 0.179833 0.607693 2.39847 0.434444 0.149424 0.0664144 0.0286383 0.0566156	15.2727 9.89582 Pressurized Liquid ib/h 10.4831 10.2486 2.67624 32.7525 214.253 78.2627 384.672 231.038 322.74 275.264 213.531 23.2282 98.9251 671.406 187.621 74.8707 0 1028.82 51.7186 104.076	0.0764887 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0170347 * 0.0153106 * 0.00535974 * 0.0170347 * 0.00535974 * 0.0170347 * 0.00535974 * 0.00535999999999999999999999999999999999	
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<sup>\*</sup> User Specified Values
? Extrapolated or Approximate Values

### **Process Streams Report All Streams Tabulated by Total Phase** SandRidge Exploration and Production, LLC Jackson County, CO Elevated Temp Feed Client Name: Job: Bighom Pad Location: Flowsheet:

Stream Properties						
Property	Units	Crude Oil	Flash Gas	Pressurized Liquid	Working and Breathing	
Temperature	°£	45	45 *	98 *	73.0739 *	
Pressure	psig	-2.57595	-2.57595	58 *	-1.6028	
Mole Fraction Vapor	<u>%</u>	0	100	1.22025	100 *	
Mole Fraction Light Liquid	% %	100	0	98.7797	0	
Male Fraction Heavy Liquid	%	0	0	0	0	
Molecular Weight	lb/lbmol	99.5561	42.6903	95,4714	54.4999	
Mass Density	lb/ft^3	44 4706	0.0968616	29.7113	0.127652	
Molar Flow	lbmol/h	62.0247	4.80009	66.8248	0.417978	
Mass Flow	lb/h	6174.94	204.917	6379,86	22.7798 *	
Vapor Volumetric Flow	ft^3/h	138,854	2115.57	214.729	178.452	
Liquid Volumetric Flow	gpm	17.3117	263.759	26.7714	22.2485	
Std Vapor Volumetric Flow	MMSCFO	0.564897	0.0437173	0.608615	0.00380679	00,,,,,000,000
Std Liquid Volumetric Flow	sgpm	17.6458 *	0.80004	18.4459	0.0810937	
Compressibility	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.00500987	0.986301	0.0390321	0.977753	
Specific Gravity		0.713024	1.47398		1.88173	
API Gravity		69.0147				
Enthalpy	Btu/h	-5.66658E+06	-212080	-5.73488E+06	-21805.3	
Mass Enthalpy	Btu/lb	-917.673	-1034.96	-898.904	-957.222	
Mass Cp	Blu/(ib*°F)	0.487371	0.382907	0.523777	0.399833	
Ideal Gas CpCv Ratio		1.05854	1.13937	1.05582	1.10119	
Dynamic Viscosity	cP	0.499897	0.00836889	***************************************	0.00766233	
Kinematic Viscosity	cSt	0.701757	5.39381		3.74724	
Thermal Conductivity	Btu/(h*ft**F)	0.0723072 ?	0.0101934		0.00930049	enemental alighetestal alighetest
Surface Tension	ib//ft	0.00150339 ?		***************************************		*********
Net Ideal Gas Heating Value	Btu/ft^3	5027.23	2101:12	4817.04	2828.71	
Net Liquid Heating Value	Stu/lb	18963.2	18530.1	18949.3	19533.5	
Gross Ideal Gas Heating Value	Stu/ft^3	5412.05	2283.81	5187,34	3066.71	
Gross Liquid Heating Value	Stu/lb	20426.7	20153.7	20418	21190.5	

Remarks

# ATTACHMENT G SUPPORTING DOCUMENTATION





# DUALSTACKTRAILER



MODEL

CAPACITY

(MSCFD)

Dual TCI 4800

3000

REQUEST MORE INFO

# Notes

1) Actual gas capacity will depend on the type of gas burned and available pressure, consult TCI.

All data presented herein is believed to be accurate at time of publication. We reserve the right to modify or change, without prior notice, any specification, statement, or information contained herein. Any specification, statement, or information used to determine product suitability must be confirmed with TCI, in writing, at time of purchase.

TCI USA &

# Exhibit 5



# **CONSTRUCTION PERMIT**

Permit number: 16JA1055 Issuance: 1

Date issued: August 28, 2017

Issued to: SandRidge Exploration and Production, LLC

Facility Name: Bighorn Pad Plant AIRS ID: 057/0051

Physical Location: NWNW Section 17 T7N R80W

County: Jackson County

General

Description: Well Production Facility

## Equipment or activity subject to this permit:

Facility Equipment ID	AIRS Point	Equipment Description	Emissions Control Description
Crude Oil Tanks	001	Fifteen (15) 1100 barrel fixed roof storage vessels used to store crude oil.	Enclosed Flare with Open Flare for emergency backup
Flare-1	002	Flaring of produced gas from heater-treaters.	Enclosed Flare
PW Tanks	003	Six (6) 1100 barrel fixed roof storage vessels used to store produced water.	Enclosed Flare with Open Flare for emergency backup
Crude Load-out	004	Truck loadout of crude oil.	No Control

This permit is granted subject to all rules and regulations of the Colorado Air Quality Control Commission and the Colorado Air Pollution Prevention and Control Act (C.R.S. 25-7-101 et seq), to the specific general terms and conditions included in this document and the following specific terms and conditions.

### REQUIREMENTS TO SELF-CERTIFY FOR FINAL AUTHORIZATION

1. YOU MUST notify the Air Pollution Control Division (the Division) no later than fifteen days of the latter of commencement of operation or issuance of this permit, by submitting a Notice of Startup form to the Division for the equipment covered by this permit. The Notice of Startup form may be downloaded online at <a href="https://www.colorado.gov/pacific/cdphe/other-air-permitting-notices">www.colorado.gov/pacific/cdphe/other-air-permitting-notices</a>. Failure to notify the Division of startup of the permitted source is a violation of Air



Quality Control Commission (AQCC) Regulation Number 3, Part B, Section III.G.1. and can result in the revocation of the permit.

- 2. Within one hundred and eighty days (180) of the latter of commencement of operation or issuance of this permit, compliance with the conditions contained in this permit shall be demonstrated to the Division. It is the owner or operator's responsibility to self-certify compliance with the conditions. Failure to demonstrate compliance within 180 days may result in revocation of the permit. A self certification form and guidance on how to self-certify compliance as required by this permit may be obtained online at <a href="https://www.colorado.gov/pacific/cdphe/air-permit-self-certification">www.colorado.gov/pacific/cdphe/air-permit-self-certification</a>. (Regulation Number 3, Part B, Section III.G.2.)
- 3. This permit shall expire if the owner or operator of the source for which this permit was issued: (i) does not commence construction/modification or operation of this source within 18 months after either, the date of issuance of this construction permit or the date on which such construction or activity was scheduled to commence as set forth in the permit application associated with this permit; (ii) discontinues construction for a period of eighteen months or more; (iii) does not complete construction within a reasonable time of the estimated completion date. The Division may grant extensions of the deadline. (Regulation Number 3, Part B, Section III.F.4.)
- 4. The operator shall complete all initial compliance testing and sampling as required in this permit and submit the results to the Division as part of the self-certification process. (Regulation Number 3, Part B, Section III.E.)
- 5. The operator shall retain the permit final authorization letter issued by the Division, after completion of self-certification, with the most current construction permit. This construction permit alone does not provide final authority for the operation of this source.

### **EMISSION LIMITATIONS AND RECORDS**

6. Emissions of air pollutants shall not exceed the following limitations. (Regulation Number 3, Part B, Section II.A.4.)

#### **Annual Limits:**

Facility	AIRS	Tons per Year				Emission
Equipment ID	Equipment ID Point	PM2.5	NO <sub>x</sub>	VOC	со	Туре
Crude Oil Tanks	001		4.0	49.7	18.2	Point
Flare-1	002	No see see	19.6	120.9	89.1	Point
PW Tanks	003	and the	une nos une	2.0	W 50 M	Point
Crude Load-out	004			38.6	N 10 10	Point

Note: See "Notes to Permit Holder" for information on emission factors and methods used to calculate limits.

Facility-wide emissions of each individual hazardous air pollutant shall not exceed 8.0 tons per year.

Facility-wide emissions of total hazardous air pollutants shall not exceed 20.0 tons per year.

The facility-wide emissions limitation for hazardous air pollutants shall apply to all permitted emission units at this facility.

Compliance with the annual limits, for both criteria and hazardous air pollutants, shall be determined on a rolling twelve (12) month total. By the end of each month a new twelve month



total is calculated based on the previous twelve months' data. The permit holder shall calculate actual emissions each month and keep a compliance record on site or at a local field office with site responsibility for Division review.

7. The emission points in the table below shall be operated and maintained with the emissions control equipment as listed in order to reduce emissions to less than or equal to the limits established in this permit. (Regulation Number 3, Part B, Section III.E.)

Facility Equipment ID	AIRS Point	Control Device	Pollutants Controlled
Crude Oil Tanks	001	Enclosed Flare (Zeeco EGF-7-40). Open Flare (Zeeco UF6-40) available for emergency/upset.	VOC and HAP
Flare-1	002	Enclosed Flares (Two [2] TCI 4800 dual-stack).	VOC and HAP
PW Tanks	003	Enclosed Flare (Zeeco EGF-7-40). Open Flare (Zeeco UF6-40) available for emergency/upset.	VOC and HAP

#### PROCESS LIMITATIONS AND RECORDS

8. This source shall be limited to the following maximum processing rates as listed below. Monthly records of the actual processing rates shall be maintained by the owner or operator and made available to the Division for inspection upon request. (Regulation Number 3, Part B, II.A.4.)

#### **Process Limits**

Facility	AIRS	Process Parameter	Annual Limit
Equipment ID	Point	Process Parameter	Annual Limit
Crude Oil	001	Condensate	741,681 barrels
Tanks	001	throughput	741,001 Daireis
Flare-1	002	Natural Gas Venting	438 MMscf
PW Tanks	003	Produced water throughput	740,104 barrels
Crude Load-out	004	Crude Oil loaded	741,681 barrels

The owner or operator shall monitor monthly process rates based on the calendar month.

Compliance with the annual throughput limits shall be determined on a rolling twelve (12) month total. By the end of each month a new twelve-month total is calculated based on the previous twelve months' data. The permit holder shall calculate throughput each month and keep a compliance record on site or at a local field office with site responsibility, for Division review.

- 9. **Point 002:** The owner or operator shall continuously monitor and record the volumetric flow rate of natural gas vented from the separators using the flow meter. The owner or operator shall use monthly throughput records to demonstrate compliance with the process limits contained in this permit and to calculate emissions as described in this permit.
- 10. **Point 004:** Crude oil loading to tank trucks shall be conducted by submerged fill. (Reference: Regulation 3, Part B, III.E)

## STATE AND FEDERAL REGULATORY REQUIREMENTS

11. **Points 001, 002, 003:** The permit number and ten digit AIRS ID number assigned by the Division (e.g. 123/4567/001) shall be marked on the subject equipment for ease of identification. (Regulation Number 3, Part B, Section III.E.) (State only enforceable)



- 12. This source is subject to the odor requirements of Regulation Number 2. (State only enforceable)
- 13. **Points 001, 002, 003:** The combustion device covered by this permit is subject to Regulation Number 7, Section XVII.B.2. General Provisions (State only enforceable). If a flare or other combustion device is used to control emissions of volatile organic compounds to comply with Section XVII, it shall be enclosed; have no visible emissions during normal operations, as defined under Regulation Number 7, XVII.A.16; and be designed so that an observer can, by means of visual observation from the outside of the enclosed flare or combustion device, or by other convenient means approved by the Division, determine whether it is operating properly. This flare must be equipped with an operational auto-igniter according to the following schedule:
  - All combustion devices installed on or after May 1, 2014, must be equipped with an operational auto-igniter upon installation of the combustion device;
  - All combustion devices installed before May 1, 2014, must be equipped with an operational auto-igniter by or before May 1, 2016, or after the next combustion device planned shutdown, whichever comes first.
- 14. **Points 001 and 003:** The storage tank covered by this permit is subject to the emission control requirements in Regulation Number 7, Section XVII.C.1. The owner or operator shall install and operate air pollution control equipment that achieves an average hydrocarbon control efficiency of 95%. If a combustion device is used, it must have a design destruction efficiency of at least 98% for hydrocarbons except where the combustion device has been authorized by permit prior to May 1, 2014. The source shall follow the inspection requirements of Regulation Number 7, Section XVII.C.1.d. and maintain records of the inspections for a period of two years, made available to the Division upon request. This control requirement must be met within 90 days of the date that the storage tank commences operation.
- 15. **Points 001 and 003:** The storage tanks covered by this permit are subject to the venting and Storage Tank Emission Management System ("STEM") requirements of Regulation Number 7, Section XVII.C.2.
- 16. **Points 001 and 003:** The open flare (for backup emergency use only) covered by this permit has been approved as an alternative emissions control device under Regulation Number 7, Section XVII.B.2.e. The open flare must have no visible emissions during normal operations, as defined under Regulation Number 7, XVII.A.16, and be designed so that an observer can, by means of visual observation from the outside of the open flare, or by other convenient means approved by the Division, determine whether it is operating properly. This open flare must be equipped with an operational auto-igniter according to the following schedule:
  - All combustion devices installed on or after May 1, 2014, must be equipped with an operational auto-igniter upon installation of the combustion device;
  - All combustion devices installed before May 1, 2014, must be equipped with an operational auto-igniter by or before May 1, 2016, or after the next combustion device planned shutdown, whichever comes first.
- 17. **Point 002:** The separator covered by this permit is subject to Regulation 7, Section XVII.G. (State Only). On or after August 1, 2014, gas coming off a separator, produced during normal operation from any newly constructed, hydraulically fractured, or recompleted oil and gas well, must either be routed to a gas gathering line or controlled from the date of first production by air pollution control equipment that achieves an average hydrocarbon control efficiency of 95%. If a combustion device is used, it must have a design destruction efficiency of at least 98% for hydrocarbons.
- 18. **Point 004:** The owner or operator shall follow loading procedures that minimize the leakage of VOCs to the atmosphere including, but not limited to (Reference: Regulation 3, Part B, III.D.2):
  - Hoses, couplings, and valves shall be maintained to prevent dripping, leaking, or other liquid or vapor loss during loading and unloading.



- All compartment hatches at the facility (including thief hatches) shall be closed and latched at all times when loading operations are not active, except for periods of maintenance, gauging, or safety of personnel and equipment.
- The owner or operator shall inspect onsite loading equipment during loading operations to monitor compliance with the above conditions. The inspections shall occur at least monthly. Each inspection shall be documented in a log available to the Division upon request.
- 19. **Point 004:** All hydrocarbon liquid loading operations, regardless of size, shall be designed, operated and maintained so as to minimize leakage of volatile organic compounds to the atmosphere to the maximum extent practicable.

### **OPERATING & MAINTENANCE REQUIREMENTS**

20. **Points 001, 002, 003:** Upon startup of these points, the owner or operator shall follow the most recent operating and maintenance (O&M) plan and record keeping format approved by the Division, in order to demonstrate compliance on an ongoing basis with the requirements of this permit. Revisions to the O&M plan are subject to Division approval prior to implementation. (Regulation Number 3, Part B, Section III.G.7.)

#### COMPLIANCE TESTING AND SAMPLING

#### **Initial Testing Requirements**

- 21. **Point 001:** The owner or operator shall complete site specific sampling including a compositional analysis of the pre-flash pressurized condensate routed to these storage tanks and, if necessary for emission factor development, a sales oil analysis to determine RVP and API gravity. Testing shall be in accordance with the guidance contained in PS Memo 05-01. Results of testing shall be used to determine site-specific emissions factors for VOC and Hazardous Air Pollutants (i.e., benzene, toluene, ethylbenzene, xylenes, n-hexane and 2,2,4-trimethylpentane) using Division approved methods. Results of site-specific sampling and analysis shall be submitted to the Division as part of the self-certification and used to demonstrate compliance with the emissions factors chosen for this emissions point. If 2,2,4-trimethylpentane emissions exceed 250 lb/yr, the owner or operator shall submit an APEN to report those emissions.
- 22. **Points 001, 002, 003:** The owner or operator shall demonstrate compliance with opacity standards, using EPA Reference Method 22, 40 C.F.R. Part 60, Appendix A, to determine the presence or absence of visible emissions. "Visible Emissions" means observations of smoke for any period or periods of duration greater than or equal to one minute in any fifteen-minute period during normal operation. (Regulation Number 7, Sections XVII.B.2. and XVII.A.16)
- 23. **Points 001 and 003 (Zeeco EGF-7-40 enclosed flare only):** A source initial compliance test shall be conducted to measure the emission rate for volatile organic compounds (VOC) in order to demonstrate compliance with a minimum destruction efficiency of 98% for VOC and HAPs from the Zeeco EGF-7-40 enclosed flare. The test shall determine the mass emission rates of volatile organic compounds at the inlet and outlet of the control device, which shall be used to determine the destruction efficiency during the test.
  - The test protocol must be in accordance with the requirements of the Air Pollution Control Division Compliance Test Manual and shall be submitted to the Division for review and approval at least thirty (30) days prior to testing. No compliance test shall be conducted without prior approval from the Division. (Regulation Number 3, Part B., Section III.G.3)
- 24. **Points 001 and 003 (emergency/backup open flare only):** No initial testing requirements for the Zeeco UF6-40 open flare.
- 25. **Point 002:** A source initial compliance test shall be conducted to measure the emission rate for volatile organic compounds (VOC) in order to demonstrate compliance with a minimum destruction efficiency of 98% for VOC and HAPs. The test shall determine the mass emission



rates of volatile organic compounds at the inlet and outlet of the control device, which shall be used to determine the destruction efficiency during the test.

The test protocol must be in accordance with the requirements of the Air Pollution Control Division Compliance Test Manual and shall be submitted to the Division for review and approval at least thirty (30) days prior to testing. No compliance test shall be conducted without prior approval from the Division. (Regulation Number 3, Part B., Section III.G.3)

26. **Point 002:** The owner/operator shall complete an initial site specific extended gas analysis ("Analysis") within one hundred and eighty days (180) after commencement of operation or issuance of this permit, whichever comes later, of the natural gas vented from this emissions unit in order to verify the VOC, benzene, toluene, ethylbenzene, xylenes, n-hexane, and 2,2,4-trimethylpentane content (weight fraction) of this emission stream. Results of the Analysis shall be used to calculate site-specific emission factors for the pollutants referenced in this permit (in units of lb/MMSCF gas vented) using Division approved methods. Results of the Analysis shall be submitted to the Division as part of the self-certification and must demonstrate the emissions factors established through the Analysis are less than or equal to, the emissions factors submitted with the permit application and established herein in the "Notes to Permit Holder" for this emissions point. If any site specific emissions factor developed through this Analysis is greater than the emissions factors submitted with the permit application and established in the "Notes to Permit Holder" the operator shall submit to the Division within 60 days, or in a timeframe as agreed to by the Division, a request for permit modification to address this/these inaccuracy(ies).

## **Periodic Testing Requirements**

27. **Point 002:** On an annual basis, the owner/operator shall complete a site specific extended gas analysis ("Analysis") of the natural gas vented from this emissions unit in order to verify the VOC content (weight fraction) of this emission stream. Results of the Analysis shall be used to calculate site-specific emission factors for the pollutants referenced in this permit (in units of lb/MMSCF gas vented) using Division approved methods. Results of the Analysis shall be submitted to the Division as part of the self-certification and must demonstrate the emissions factors established through the Analysis are less than or equal to, the emissions factors submitted with the permit application and established herein in the "Notes to Permit Holder" for this emissions point. If any site specific emissions factor developed through this Analysis is greater than the emissions factors submitted with the permit application and established in the "Notes to Permit Holder" the operator shall submit to the Division within 60 days, or in a timeframe as agreed to by the Division, a request for permit modification to address this/these inaccuracy(ies).

#### ADDITIONAL REQUIREMENTS

- 28. A revised Air Pollutant Emission Notice (APEN) shall be filed: (Regulation Number 3, Part A, II.C.)
  - Annually by April 30<sup>th</sup> whenever a significant increase in emissions occurs as follows:

#### For any criteria pollutant:

For sources emitting less than 100 tons per year, a change in actual emissions of five (5) tons per year or more, above the level reported on the last APEN; or

For volatile organic compounds (VOC) and nitrogen oxides sources ( $NO_x$ ) in ozone nonattainment areas emitting less than 100 tons of VOC or  $NO_x$  per year, a change in annual actual emissions of one (1) ton per year or more or five percent, whichever is greater, above the level reported on the last APEN; or

For sources emitting **100 tons per year or more**, a change in actual emissions of five percent or 50 tons per year or more, whichever is less, above the level reported on the last APEN submitted; or



#### For any non-criteria reportable pollutant:

If the emissions increase by 50% or five (5) tons per year, whichever is less, above the level reported on the last APEN submitted to the Division.

- Whenever there is a change in the owner or operator of any facility, process, or activity;
   or
- Whenever new control equipment is installed, or whenever a different type of control equipment replaces an existing type of control equipment; or
- Whenever a permit limitation must be modified; or
- No later than 30 days before the existing APEN expires.
- 29. The exhaust stacks for the following emission points shall match the stack height and stack diameter parameters specified in the table below:

Control Equipment	AIRS Point	Minimum stack height above ground level (ft)	Stack diameter (ft)
Storage Tanks Flares [Zeeco EGF-7-40 and Zeeco UF6-40]	001 and 003	40	6.62
Produced Gas Flare [TCI 4800 dual-stack]	002	27.8	8.29
Produced Gas Flare [TCI 4800 dual-stack]	002	27.8	8.29

- 30. This source is subject to the provisions of Regulation Number 3, Part C, Operating Permits (Title V of the 1990 Federal Clean Air Act Amendments). The application for the Operating Permit is due within one year of the earliest commencement of operation of any piece of equipment covered by this permit.
- 31. The requirements of Colorado Regulation No. 3, Part D shall apply at such time that any stationary source or modification becomes a major stationary source or major modification solely by virtue of a relaxation in any enforceable limitation that was established after August 7, 1980, on the capacity of the source or modification to otherwise emit a pollutant such as a restriction on hours of operation or limits on production or material throughputs (Reference: Regulation Number 3, Part D, VI.B.4).

#### **GENERAL TERMS AND CONDITIONS**

- 32. This permit and any attachments must be retained and made available for inspection upon request. The permit may be reissued to a new owner by the APCD as provided in AQCC Regulation Number 3, Part B, Section II.B. upon a request for transfer of ownership and the submittal of a revised APEN and the required fee.
- 33. If this permit specifically states that final authorization has been granted, then the remainder of this condition is not applicable. Otherwise, the issuance of this construction permit does not provide "final" authority for this activity or operation of this source. Final authorization of the permit must be secured from the APCD in writing in accordance with the provisions of 25-7-114.5(12)(a) C.R.S. and AQCC Regulation Number 3, Part B, Section III.G. Final authorization cannot be granted until the operation or activity commences and has been verified by the APCD as conforming in all respects with the conditions of the permit. Once self-certification of all points has been reviewed and approved by the Division, it will provide written documentation of such final authorization. Details for obtaining final authorization to operate are located in the Requirements to Self-Certify for Final Authorization section of this permit.
- 34. This permit is issued in reliance upon the accuracy and completeness of information supplied by the owner or operator and is conditioned upon conduct of the activity, or construction, installation and operation of the source, in accordance with this information and with



- representations made by the owner or operator or owner or operator's agents. It is valid only for the equipment and operations or activity specifically identified on the permit.
- 35. Unless specifically stated otherwise, the general and specific conditions contained in this permit have been determined by the APCD to be necessary to assure compliance with the provisions of Section 25-7-114.5(7)(a), C.R.S.
- 36. Each and every condition of this permit is a material part hereof and is not severable. Any challenge to or appeal of a condition hereof shall constitute a rejection of the entire permit and upon such occurrence, this permit shall be deemed denied *ab initio*. This permit may be revoked at any time prior to self-certification and final authorization by the Air Pollution Control Division (APCD) on grounds set forth in the Colorado Air Quality Control Act and regulations of the Air Quality Control Commission (AQCC), including failure to meet any express term or condition of the permit. If the Division denies a permit, conditions imposed upon a permit are contested by the owner or operator, or the Division revokes a permit, the owner or operator of a source may request a hearing before the AQCC for review of the Division's action.
- 37. Section 25-7-114.7(2)(a), C.R.S. requires that all sources required to file an Air Pollution Emission Notice (APEN) must **pay an annual fee** to cover the costs of inspections and administration. If a source or activity is to be discontinued, the owner must notify the Division in writing requesting a cancellation of the permit. Upon notification, annual fee billing will terminate.
- 38. Violation of the terms of a permit or of the provisions of the Colorado Air Pollution Prevention and Control Act or the regulations of the AQCC may result in administrative, civil or criminal enforcement actions under Sections 25-7-115 (enforcement), -121 (injunctions), -122 (civil penalties), -122.1 (criminal penalties), C.R.S.

Bv:

Andy Gruel, P.E. Permit Engineer

### **Permit History**

Issuance	Date	Description
Issuance 1	This Issuance	Issued to SandRidge Exploration and Production, LLC.



Notes to Permit Holder at the time of this permit issuance:

- 1) The permit holder is required to pay fees for the processing time for this permit. An invoice for these fees will be issued after the permit is issued. The permit holder shall pay the invoice within 30 days of receipt of the invoice. Failure to pay the invoice will result in revocation of this permit. (Regulation Number 3, Part A, Section VI.B.)
- 2) The production or raw material processing limits and emission limits contained in this permit are based on the consumption rates requested in the permit application. These limits may be revised upon request of the owner or operator providing there is no exceedance of any specific emission control regulation or any ambient air quality standard. A revised air pollution emission notice (APEN) and complete application form must be submitted with a request for a permit revision.
- 3) This source is subject to the Common Provisions Regulation Part II, Subpart E, Affirmative Defense Provision for Excess Emissions During Malfunctions. The owner or operator shall notify the Division of any malfunction condition which causes a violation of any emission limit or limits stated in this permit as soon as possible, but no later than noon of the next working day, followed by written notice to the Division addressing all of the criteria set forth in Part II.E.1 of the Common Provisions Regulation. See: https://www.colorado.gov/pacific/cdphe/aqcc-regs
- 4) The following emissions of non-criteria reportable air pollutants are estimated based upon the process limits as indicated in this permit. This information is listed to inform the operator of the Division's analysis of the specific compounds emitted if the source(s) operate at the permitted limitations.

AIRS Point	Pollutant	CAS#	Uncontrolled Emissions (lb/yr)	Controlled Emissions (lb/yr)
	Benzene	71432	5681	114
	Toluene	108883	4739	95
	Ethylbenzene	100414	918	19
001	Xylenes	1330207	1800	36
	n-Hexane	110543	54185	1084
	2,2,4- Trimethylpentane	540841		- Initial Testing equire sampling
	Benzene	71432	16228	325
	Toluene	108883	20205	404
	Ethylbenzene	100414	6128	123
002	Xylenes	1330207	12251	245
	n-Hexane	110543	205891	4118
	2,2,4- Trimethylpentane	540841		- Initial Testing equire sampling
003	Benzene	71432	5181	104
003	n-Hexane	110543	16283	326
004	Benzene	71432	135	N/A - not controlled
004	n-Hexane	110543	1187	N/A - not controlled

Note: All non-criteria reportable pollutants in the table above with uncontrolled emission rates above 250 pounds per year (lb/yr) are reportable and may result in annual emission fees based on the most recent Air Pollution Emission Notice.



5) The emission levels contained in this permit are based on the following emission factors:

#### Point 001:

CAS#	Pollutant	Uncontrolled Emission Factors lb/bbl	Controlled Emission Factors lb/bbl	Source
	NOx	0.0108	0.0108	AP-42 Ch 13.5
	CO	0.0491	0.0491	AP-42 Ch 13.5
	VOC	6.690	0.13381	Drottov model
71432	Benzene	0.008	0.00015	ProMax model based on site-
108883	Toluene	0.006	0.00013	specific
100414	Ethylbenzene	0.0012	0.00002	pressurized liquid
1330207	Xylene	0.002	0.00005	analysis
110543	n-Hexane	0.073	0.00146	unacysis
540841	2,2,4-Trimethylpentane	Not Measured - Initia	al Testing Requiremer	its require sampling

Note: The controlled emissions factors for this point are based on the flare control efficiency of 98%. NOx and CO emissions are based on a waste gas heat content of 2127 Btu/scf, and a waste gas volume of 74.418 scf/bbl based on a ProMax model.

#### Point 002:

CAS#	Pollutant	Uncontrolled Emission Factors (lb/MMscf)	Controlled Emission Factors (lb/MMscf)	Source
	NOx	89.22	89.22	AP-42 Ch. 13.5
	СО	406.72	406.72	AP-42 Ch. 13.5
	VOC	27587.00	551.74	Displacement Equation/Mass Balance using site- specific gas sample collected 6/15/2016
71432	Benzene	37.05	0.74	
108883	Toluene	46.13	0.92	
100414	Ethylbenzene	13.99	0.28	
1330207	Xylene	27.97	0.56	
110543	n-Hexane	470.07	9.40	
540841	2,2,4-Trimethylpentane	Not Measured - Initial Testing Requirements require sampling		

Note: The controlled emissions factors for this point are based on the flare control efficiency of 98%. NOx and CO emissions are based on a waste gas heat content of 1312 Btu/scf.

### Point 003:

CAS#	Pollutant	Uncontrolled Emission Factors Ib/bbl	Controlled Emission Factors Ib/bbl	Source
	VOC	0.262	0.0052	CDPHE State
71432	Benzene	0.007	0.0001	Default Emission
110543	n-Hexane	0.022	0.0004	Factors

Note: The controlled emissions factors for this point are based on the flare control efficiency of 98%.

## Point 004:

CAS#	Pollutant	Uncontrolled Emission Factors lb/bbl	Controlled Emission Factors lb/bbl	Source
	VOC	0.104		State default
71432	Benzene	0.000181	N/A - not	emission factors
110543	n-Hexane	0.00160	controlled	for crude oil loadout



- 6) In accordance with C.R.S. 25-7-114.1, each Air Pollutant Emission Notice (APEN) associated with this permit is valid for a term of five years from the date it was received by the Division. A revised APEN shall be submitted no later than 30 days before the five-year term expires. Please refer to the most recent annual fee invoice to determine the APEN expiration date for each emissions point associated with this permit. For any questions regarding a specific expiration date call the Division at (303)-692-3150.
- 7) This permit fulfills the requirement to hold a valid permit reflecting the storage tank and associated control device per the Colorado Oil and Gas Conservation Commission rule 805b(2)(A) when applicable.
- 8) This facility is classified as follows:

Applicable Requirement	Status	
Operating	Major Source of: VOC, CO	
Permit	Synthetic Minor Source of: HAPs (total, and benzene, toluene and n-hexane)	
PSD	Synthetic Minor Source of: VOC	
MACT HH	Area Source Requirements: Not Applicable	

9) Full text of the Title 40, Protection of Environment Electronic Code of Federal Regulations can be found at the website listed below:

http://ecfr.gpoaccess.gov/

Part 60: Standards of Performance for New Stationary Sources			
NSPS	60.1-End	Subpart A - Subpart KKKK	
NSPS	Part 60, Appendixes	Appendix A - Appendix I	
Part 63:	Part 63: National Emission Standards for Hazardous Air Pollutants for Source Categories		
MACT	63.1-63.599	Subpart A - Subpart Z	
MACT	63.600-63.1199	Subpart AA - Subpart DDD	
MACT	63.1200-63.1439	Subpart EEE - Subpart PPP	
MACT	63.1440-63.6175	Subpart QQQ - Subpart YYYY	
MACT	63.6580-63.8830	Subpart ZZZZ - Subpart MMMMM	
MACT	63.8980-End	Subpart NNNNN - Subpart XXXXXX	

